UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

SEP 27 2002

In Reply Refer To:
SWR-02-SA-6164:MET

Mr. John F. Davis
Regional Resources Manager
U.S. Bureau of Reclamation
2800 Cottage Way
Sacramento, California 95825-1898

Dear Mr. Davis:

Please find enclosed the National Marine Fisheries Service's (NOAA Fisheries) final biological opinion (Enclosure 1) concerning the effects of the Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project on the endangered Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), the threatened Central Valley spring-run Chinook salmon (*O. tshawytscha*), and the Central Valley steelhead (*O. mykiss*).

The biological opinion concludes that the proposed project is not likely to jeopardize the continued existence of the above listed species. Because NOAA Fisheries believes there is the likelihood of incidental take of listed species as a result of the proposed project, an incidental take statement is included with the biological opinion. This take statement includes reasonable and prudent measures that NOAA Fisheries believes are necessary and appropriate to reduce, minimize, and monitor project impacts. Terms and conditions to implement the reasonable and prudent measures are presented in the take statement and must be adhered to in order for take incidental to this project to be exempted.

In addition, we have enclosed an Essential Fish Habitat (EFH) consultation document (Enclosure 2) including EFH conservation recommendations. The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) set forth new mandates for the NOAA Fisheries and federal action agencies to protect important marine and anadromous fish habitat. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NOAA Fisheries regarding potential adverse effects of their actions on EFH, and respond in writing to NOAA Fisheries "EFH Conservation Recommendations." The Pacific Fisheries Management Council has identified EFH for the Pacific salmon fishery in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan. This EFH designation includes the habitat found in the Sutter Bypass which is affected by the proposed project.

We appreciate your continued cooperation in the conservation of listed species and their habitat, and look forward to working with you and your staff in the future. If you have any questions regarding this document, please contact Mr. Michael Tucker in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, CA 95814. Mr. Tucker may be reached by telephone at (916) 930-3604 or by Fax at (916) 930-3629.

Sincerely,

James H Lecky
for Rodney R. McInnis
Acting Regional Administrator

Enclosures

cc: NOAA Fisheries-PRD, Long Beach, CA
Stephen A. Meyer, ASAC, NOAA Fisheries, Sacramento, CA

Enclosure 1

BIOLOGICAL OPINION

Agency: U.S. Bureau of Reclamation

Activity: Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project

Consultation Conducted By: Southwest Region, National Marine Fisheries Service.

Date Issued: SEP 27 2002

BACKGROUND AND CONSULTATION HISTORY

In 1997 the U.S. Fish and Wildlife Service (FWS) released the Revised Draft Restoration Plan for the Anadromous Fish Restoration Program (AFRP). This plan included goals and objectives which formed the basis for the Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project. Since that time, FWS has been working collaboratively with the U.S. Bureau of Reclamation (Reclamation), the National Marine Fisheries Service (NOAA Fisheries), the California Department of Fish and Game (DFG) and several private and corporate stakeholders to develop, design and fund the proposed project.

On January 24, 2002 NOAA Fisheries received a letter from Reclamation, the lead federal agency for the proposed project, requesting initiation of formal consultation under Section 7 of the Federal Endangered Species Act (ESA). However, due to a mailing error, the initiation package did not include a biological assessment (BA) for the project, and was therefore insufficient for initiation of formal consultation. Following verbal notification of the error, Reclamation submitted the final BA for the project which was received by NOAA Fisheries on February 19, 2002.

DESCRIPTION OF THE PROPOSED ACTION

Project Location and Description of the Action Area

The proposed project is located in the Sutter Bypass in Sutter County, California. The Sutter Bypass was built to convey winter flood waters from the Sacramento River and Butte Creek around areas of human development and back into the Feather River near its confluence with the Sacramento River. The Sutter Bypass extends from just north of State Route 20 (SR 20) near Meridian to the confluence of the Feather and Sacramento Rivers near Verona. North (upstream) of the Sutter Bypass, Butte Creek flows southward through Butte Slough and continues south to the Sutter Bypass. Near SR 20, Butte Slough bifurcates into the East and West Side Channels of the Sutter Bypass which then convey Butte Creek flows southward to the Sacramento River.

The action area for this project includes the active stream channels and riparian corridors of the Sutter Bypass starting at and including the East-West Weir on the north end of the Sutter Bypass and continuing down the West Side Channel to the Tisdale Bypass approximately one third of a mile below Weir No.1, the lower most structure to be modified under this project.

Proposed Activities

The proposed action is the implementation of a fish passage improvement project in the West Side Channel of the Sutter Bypass. The primary objective of the proposed project is to improve anadromous fish survival and passage, both upstream and downstream, through the Lower Butte Creek system. The proposed project would meet these objectives while maintaining the ability to divert water for agricultural irrigation and waterfowl habitat management by private and public entities.

Reclamation, in cooperation with Ducks Unlimited, Inc. (DU) and DFG propose to replace or rehabilitate 5 weirs within the East and West Side channels of the Sutter Bypass, which is part of Lower Butte Creek. The weirs that are proposed to be modified include:

A) The East-West Weir
B) Weir No. 5
C) Weir No. 3
D) Giusti Weir
E) Weir No. 1.

The project proposal also includes the installation of fish screens to prevent the entrainment of juvenile salmonids at 3 agricultural diversions associated with Weir No. 5, Weir No. 3, and Giusti Weir. Figure 1 shows a map of the proposed project area including the five weirs.

<u>East-West Weir</u>
The East-West Weir would be completely removed and replaced. A new weir, 40 feet (ft) long, would span the East Side Channel. The weir would consist of 7 bays, each 5 ft wide. Galvanized steel grating and removable handrails would be installed across the top of the weir to provide access to the bays and to the channel's left bank. A concrete abutment would anchor the weir to the left bank.

On the right side of the weir, a new 42-ft-long fish ladder approved by DFG and NOAA Fisheries would be installed. The fish ladder would be a Half-Ice-Harbor design consisting of 3 pools. Two of the pools would be 8 ft wide by 10 ft long, and 1 pool would be 8 ft wide by 15 ft long. The latter pool would contain a 2-ft-square escape opening for juvenile salmonids migrating downstream. A trash rack would be placed at the ladder's upstream exit to prevent logs and other debris from entering the fish ladder. The invert (bottom) elevation of the fish ladder would be 30 ft above mean sea level (msl) at its entrance and 34 ft above msl at its exit. The right concrete wall of the fish ladder, which would extend about 35 ft from the ladder in both the upstream and downstream directions, would also serve as a retaining wall. Behind or to the right of the retaining wall, a gravel parking area would be constructed to provide access to the fish ladder and weir.

The design surface elevation range of the headwater pool upstream of the East-West Weir is 37–38.5 ft National Geodetic Vertical Datum (NGVD) the design water surface elevation range of the tailwater pool downstream of the weir is 35.5–37.5 ft. Therefore, the maximum difference in elevation on the 2 sides of the weir would be 3.0 ft. The fish ladder is designed to operate within a range of flows of 5–40 cfs through the fish ladder. All flows up to 40 cfs will be channeled through the fish ladder. When total flows exceed 40 cfs the fish ladder will maintain a 40 cfs flow with the remainder spilling over the weir. Median monthly flows in the West Side Channel range throughout the year from 50 to 694 cfs.

Construction of the East-West Weir would require the removal of riparian vegetation on both sides of the East Side Channel. Approximately 220 feet of the channel's right bank at the project site would be excavated; fill would be placed along 120 feet of the left bank. The new weir would be placed in a slightly different position in the channel from that of the present weir to enhance the flow of water through it and to prevent water from overtopping the right bank of the channel. Also, the new alignment is expected to provide better flow conditions at the entrance to and exit from the fish ladder.

The new weir would be constructed in 2 phases. The right half of the weir would be constructed in the first phase. A temporary cofferdam of sheet piles and sandbags would be built on the upstream side of the weir, extending from the right bank to about the middle of the existing weir. Enough of the left side of the weir would remain open to allow continuous operation during construction of the weir's right half. Material used in the sandbags would be river-run gravel that would be left in the stream.

The left half of the weir would be constructed in the second phase. The cofferdam would be moved so that it would extend from the channel's left bank to where the new weir was completed during the first phase of construction. A bypass channel would not have to be built for the second phase because the right half of the new weir and the fish ladder would be operational.

Two staging areas are required to construct the new East-West Weir. Construction would involve moving materials to both the right and left abutments of the weir. The majority of the material would be moved in from the right abutment (the south side). Loads of concrete, lumber, and steel would be brought in and used on the site. The fish ladder and right side of the new weir would be excavated, formed, and placed from the right side. The access would be via the new bridge over the East Side Channel constructed by the California Department of

Transportation (Caltrans) in conjunction with the widening of the SR 20 bridge. The access road would be improved and widened without removing any large trees or woody growth. Because the new fish ladder would encroach on the existing turnaround that would be used for a staging area on the right bank, the turnaround would be enlarged.

Access to the weir's left abutment would be from West Butte Road, on the north side of the abandoned bridge near the construction site. The access would be across private property under a temporary easement for the construction period. The staging area on the left abutment would be much smaller than the one on the right abutment. Major clearing would not be necessary because the existing area appears to be sufficiently clear of large trees and heavy underbrush.

After construction of the cofferdams, the water inside the areas sealed off by the cofferdams would be pumped out, conveyed through temporary bypass piping, and discharged into the East Side Channel downstream of the weir. Construction on the abutments and weir would be done from the dry areas inside of and between the cofferdams, existing weir, and right or left banks.

Weir No. 5

At Weir No. 5, the concrete sill, bay walls, and left abutment would be rehabilitated and a new fish passage facility would be constructed.

The weir's concrete sill is believed to be in good condition but would be inspected to determine its condition upon completion of dewatering. The proposed rehabilitation of the weir's bay walls and left abutment consists of raising these structures from an elevation of 39.17 ft to 40.17 ft NGVD. Along the entire length of the weir, galvanized steel grating and removable handrails would be installed to allow safe access to the bays and to the left abutment of the structure.

The proposed new fish passage facility at Weir No. 5 would be located along the right bank of the West Side Channel. Extending approximately 180 ft upstream from the weir, the facility would include a 70-ft-long fish ladder and Butte Slough Irrigation Company's (BSIC) 110-ft-long irrigation diversion screen structure. The proposed fish ladder is a Half-Ice-Harbor design consisting of 3 pools each 8 ft wide by 10 ft long and 2 pools each 8 ft wide by 15 ft long; 1 of the 8-by-15-ft pools would contain a 2-ft-square escape opening for juvenile fish migrating downstream. Fish would be safely conveyed past BSIC's diversion via the proposed fish passage facility.

BSIC's diversion would be screened with a fish screen that would meet both DFG and NOAA Fisheries criteria. The screen would be placed nearly parallel with the direction of flow in the conveyance channel to avoid fish entrainment and to prevent debris accumulation. Openings in the screen would be 1.75 millimeters (mm) wide. The fish screen would be cleaned mechanically or by air-bursts. A 12-ft-wide trash rack (with openings 12 inches wide by 24 inches high) would be constructed upstream of BSIC's diversion at the exit of the new fish passage facility to prevent logs and other debris from entering. The trash rack would be angled in the upstream direction. In addition, a new high density polyethylene (HDPE) pipe would be installed inside BSIC's existing 48-inch diameter diversion pipeline and would be grouted in place.

The bottom elevations of the entrance and exit to the proposed fish passage facility are 26 ft and 31 ft NGVD, respectively. The top elevation of the fish screen at BSIC's diversion would be 36 ft NGVD, or 4.5 ft above the floor of the fish screen facility. Upstream of the weir, the maximum design surface water elevation is 38 ft NGVD. The design flow through the fish ladder ranges from 5 to 40 cfs.

Along the entire length of the fish passage facility, galvanized steel grating would be installed, and a removable handrail would be placed on the channel side of the structure. The right wall of the fish passage facility would serve as a retaining wall for the right bank of the channel. Behind or to the right of the retaining wall, a 20X50 foot gravel parking area would be constructed to improve access to the weir, fish ladder, and fish screen facilities.

The staging area would be located on the right bank between the toe (bottom) of the levee and the channel bank. Other than the movement of trucks and equipment over the levee, there would be minimal activity on the levee embankment. The materials delivered and stored would be steel, lumber for forms, and concrete.

All construction on Weir No. 5 would take place from the right abutment of the weir on the water side of the levee near the BSIC diversion and possibly at the outlet end of the diversion tunnel. The work on the weir and fish ladder would take place near the right abutment of the structure. The fish channel and diversion headworks with the fish screen would be constructed from the area between the West Side Channel and the water-side toe of the levee. The placement of the HDPE liner in BSIC's diversion pipe would be done from either the outlet end or the inlet end of the diversion pipe and would not cause significant removal of vegetation in either area. The new pipe would be placed inside the existing pipe; no excavation would take place.

A temporary cofferdam of sheet piles and gravel would seal off an area from a point just upstream of the fish screen entrance to the weir. After installation of the cofferdam, water would be removed from between the cofferdam and the right bank of the West Side Channel and placed back into the channel providing that it does not increase turbidity above the approved level. Vegetation on the right bank would be removed for construction of the fish passage and fish screening facilities.

Weir No. 3
Proposed actions at Weir No. 3 include elements to improve fish passage upstream, decrease debris accumulation, and increase operator safety when installing or removing stop logs which control the elevation of the spillway on the weir. The improvements would involve demolishing the existing wood and metal portions of Weir No. 3; this work is included in part

1 of the proposed project. Presently, the stop log guides are angled with respect to the streambed, making it difficult to insert or remove the stop logs. New concrete dividing walls would be constructed to re-create the 6 bays, each 5 ft wide. The concrete walls would incorporate guide rails to accommodate stop logs and would be angled at 50° on their upstream edge to reduce debris accumulation on the divider walls. The far right bay of the weir would be modified to include a fish ladder with 2 pools, each 5 ft by 10 ft. Galvanized steel grating, support beams, and a removable handrail would be constructed across the top of the weir.

Weir No. 3's sill would be checked after dewatering of the project site to determine whether other improvements are needed. An 8-inch overlay of concrete would be placed on top of the existing weir sill.

The earthen overflow section and concrete spillway at the left of the weir would be cleared of underbrush and reshaped to strengthen them and to reduce debris accumulation. The concrete apron of the spillway would be demolished and replaced with riprap. Riprap would also be placed on the downstream side of the embankment and weir.

The concrete abutments for Weir No. 3 would remain in place. The downstream wing wall of the right abutment would be demolished and replaced, however, because it has slipped away from the abutment and no longer provides structural support. The new wing wall would be constructed of concrete and anchored into the right abutment.

Constructing the proposed improvements for Weir No. 3 would require the placement of a cofferdam on the upstream side of the weir to dewater the area around the weir and create dry conditions for construction. The cofferdam would be constructed of sheet piles and sandbags and would extend from the right bank of the West Side Channel upstream of the weir to a point on the earthen overflow section to the left of the left abutment. Before constructing the cofferdam, however, the contractor would excavate a temporary bypass channel in the left embankment to allow passage of water and fish. The temporary channel would be protected with riprap if necessary to prevent erosion. The cofferdam and water passage arrangement would remain in place during construction activities at Weir No. 3. When work on the weir has been completed, the contractor would fill in the temporary bypass channel in the left embankment and remove the cofferdam.

Two temporary staging areas are proposed for use during construction. The primary staging area for the project would be in a clearing on the right bank that is accessible by a dirt road from the top of the levee. A second, smaller staging area would be in a wooded area on the left bank near the earthen and concrete embankment of the weir. The left bank of the channel is accessible via the road and bridge immediately upstream of Weir No. 3. The contractor would need this second staging area for access to and construction of the temporary water and fish passage channel in the earthen embankment and spillway.

The construction at Weir No. 3 would be fairly simple and would consist of removing the downstream wing wall on the right abutment, replacing the wood bents with concrete, and reshaping the left earthen embankment. The area on the right abutment would probably be dewatered to facilitate the construction of some of the bents and the downstream wing wall. In completing the remainder of the bents, the flow of water may be directed to the overflow area on the left abutment.

To reach the project area, small trucks and equipment would travel from the levee road to the parking and stockpiling area between the West Side Channel and the toe of the levee. All concrete, lumber, and steel would be brought in from the right abutment. Access to the left abutment will be through the Sutter National Wildlife Refuge; permits for access have been obtained from the USFWS.

Lanza Diversions

At the Lanza diversions upstream of Weir No. 3, the proposed project consists of removing the 3-cfs diversion pump and leaving the 6-cfs diversion pump as the only instream diversion from the West Side Channel. In place of the 3-cfs diversion pump, a division box would be constructed at the point of discharge from the 6-cfs diversion, and an 18-inch-diameter pipeline would be constructed from this diversion point to the private wetland, a distance of about 2,000 ft. Another much shorter pipeline would be constructed from the division box to the adjacent rice field. This arrangement would allow water to be delivered to the managed wetland area late in the season without running water across the rice field where harvesting or other agricultural operations are being conducted.

A fish screen is proposed for the 6-cfs diversion pump's intake. This fish screen would be a cylinder screen that would be cleaned by compressed air. The equipment for cleaning the screen would be installed and removed every season, as is currently done with the motor for the diversion pump.

At the 6-cfs diversion pump location, clearing of vegetative growth would be minimal because there is little existing vegetation. There are no trees in the immediate area of the project site.

The same is true along the access road to the private wetland area on the left bank of the West Side Channel. The proposed 18-inch-diameter pipeline would be installed in a trench that parallels this road. The trench would be about 3–4 ft deep and would be constructed on the land side of the access road.

Installing the proposed fish screen on the 6-cfs diversion would require the placement of a cofferdam around the diversion's intake in the West Side Channel. The cofferdam would allow the contractor to dewater the area immediately around the intake and create dry conditions for constructing the fish screen. Sheet piles and sandbags would be used to construct the cofferdam, which would remain in place until the completion of all construction activities.

To install the division box, a small pit would be excavated at the discharge end of the 6-cfs diversion pump. This excavation pit would be approximately 6 ft square and 4 ft deep. The walls of the division box would be formed in the excavation pit and constructed of concrete. Much of the division box structure would be below ground surface with only a small portion extending aboveground. The top of the box would be open to allow easy access for maintenance.

Giusti Weir

At Giusti Weir, the 3 pipes through the earthen weir embankment would be removed and 1 new 48-ft, 66-inch-diameter corrugated metal pipe would be installed along the right bank of the West Side Channel. The new pipe would have an 8-ft-square concrete drop inlet structure upstream of the weir. A stop log in the inlet structure would control upstream surface water elevations, which would be important during extreme low flows so that fish could pass through the natural fish passage channel on the left side of the embankment. The existing earthen weir would be cleared of vegetation and reshaped. Riprap would be placed on the upstream and downstream sides of the earthen weir to prevent erosion. No work would be conducted in the natural fish bypass channel.

The 48-inch-diameter diversion pipe immediately upstream of Giusti Weir would be modified. The 48-inch pipe diverts flow for irrigation. The existing slide gate will be removed and a new 48-inch slide gate installed at the diversion's intake. A fish screen will be installed at the intake to the diversion and aligned parallel with the flow of water in the West Side Channel to avoid entrainment of fish and the accumulation of debris. The fish screen, which would be cleaned mechanically, would be wedge wire with 1.75-mm openings and would meet DFG and NOAA Fisheries standards.

To enhance the velocity of flows past the fish screen, a small portion of the right bank that juts out into the water upstream of the diversion would be removed. A retaining wall would be constructed to reinforce the bank, which would require removal of 2 trees and some smaller riparian vegetation. Riprap would be placed along the right bank on the water side of the proposed fish screen and retaining wall to prevent erosion.

Access for construction activities would be from the right abutment and would be confined to the area from the bank of the West Side Channel to the water-side toe of the levee. A new diversion headwall and fish screen would be constructed in the area immediately upstream of the right abutment. Before construction, a temporary cofferdam would be installed that would extend from the right bank to a location along the embankment, to the right of the natural fish passage channel. The cofferdam would be constructed of sheet piles and sandbags filled with river-run gravel. Water would be removed from between the cofferdam, the weir, and the right bank to create dry conditions for construction. All materials required for the cofferdam and dewatering would be removed after construction is completed. No SRA vegetation would be removed to create the construction staging area. The natural fish bypass on the left abutment would be undisturbed. The embankment would be reshaped and protective riprap placed to prevent erosion.

Weir No. 1

The concrete structure at Weir No. 1 would be retrofitted with a new dam that could be lowered or raised (like a rubber dam) to facilitate the passing of trash. An adjustable dam would make the weir easier to operate and maintain. To the left of the weir's left abutment, an overflow channel would be constructed that would pass water when the flow of water in the West Side Channel exceeds 700–800 cfs. When the flow of water is less than 700 cfs, maintenance equipment would be able to pass over the overflow channel to access Weir No. 1 for maintenance.

The fish ladder at Weir No. 1 would be replaced with a new Half-Ice-Harbor design. Approximately 80 ft long, the new fish ladder would consist of one 8-ft-by-12-ft bay with low-flow and high-flow entrances for fish; five 8-ft-by-10-ft bays, 1 of which would have an escape opening for juvenile salmonids; and one 8-ft-by-6-ft bay that would serve as the exit for the ladder. The exit would be on the right bank of the West Side Channel, upstream of the weir's right abutment. A trash rack would be placed at the fish ladder's exit. This ladder would allow fish to pass through a range of flows from a minimum of 5 cfs to a maximum of 40 cfs; flows exceeding 40 cfs would pass over the new dam or overflow channel. Operating the fish ladder would require that the stop logs be adjusted and the orifices be opened and closed under varying flow conditions.

The water surface elevation in the West Side Channel upstream of Weir No. 1 would be slightly lower than historical levels because of the change in the source of water supply for the Sutter National Wildlife Refuge. However, the new water level would continue to maintain a majority of the wetlands located upstream of Weir No. 1, and yet not affect the irrigation of agricultural lands west of the West Levee of the Sutter Bypass. In addition, this operation would allow continued passage of fish at Giusti Weir without the installation of a fish ladder.

Construction at Weir No. 1 and the fish ladder would be done from the right abutment. Access would be down the levee on a ramp that may have to be constructed. If a ramp is necessary, it would be removed when construction has been completed. The excavation and placement of concrete would be done from the right side of the West Side Channel. Dewatering the area, which would be isolated by constructing a cofferdam of sheet piles and gravel, would facilitate construction. Water would continue to flow through the existing opening in the center of the embankment to the left of the weir. The construction staging area would be between the water-side toe of the West Levee and Weir No. 1. Two mature cottonwood trees on the right abutment may need to be removed or trimmed heavily to provide room for construction. If access is needed from the left abutment, a special-use permit would be obtained from USFWS.

The following measures intended to minimize impacts to listed species and other sensitive natural resources have been incorporated into the project description and will be adhered to by the construction contractors.

1. A stormwater pollution prevention plan (SWPPP) will be prepared and implemented as part of the National Pollutant Discharge Elimination System (NPDES) General Construction Activity Storm Water Permit. The SWPPP will include measures to minimize erosion and sediment transport to the West Side Channel. It will include

- best management practices (e.g., sediment containment devices, protection of construction spoils, proper installation of cofferdams);
- site restoration;
- postconstruction monitoring of the effectiveness of best management practices;
- contingency measures;
- details about contractor responsibilities;
- a list of responsible parties; and
- a list of agency contacts.

Measures in the SWPPP will include, at a minimum,

- avoiding work or equipment operation in flowing water during in-channel activities by constructing cofferdams and diverting all flows around construction sites;
- conducting all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system, including constructing silt barriers immediately downstream of the construction site, and minimizing disruption of the streambed at and adjacent to the construction site;
- identifying all areas requiring clearing, grading, revegetation, and recontouring and minimizing the areas to be cleared, graded, and recontoured;
- storing construction spoils out of the stream (above the ordinary high-water mark) and protecting receiving waters from these erosion source areas with sedimentation fences or other effective sediment control devices;
- grading spoil sites to minimize surface erosion; and
- covering bare areas with mulch and revegetating all cleared areas with appropriate native, noninvasive species.

These measures will be incorporated into the project design as conditions of a DFG Section 1601 streambed alteration agreement as well as terms and conditions of the accompanying incidental take statement. An application for a waste discharge permit will be filed, and compliance with the monitoring and reporting requirements for project construction is necessary.

1. Instream construction activities will be conducted by the contractor between July 1 and October 15. The construction could be extended (with NOAA Fisheries and DFG approval) if the mean daily water temperatures consistently exceed 68°F. This timing will generally reduce the potential for sediment and other pollutants to enter surface waters and adversely affect water quality and effects on federally protected fish species. Keeping the construction time within low-precipitation months also decreases the risk of bank erosion. Streambanks and adjacent areas that are disturbed by construction activities will be stabilized to avoid increased erosion during subsequent storms and runoff.

   Once cofferdams are in place, and just before pumping out the water to the channel side, the ponded water will be surveyed by a qualified, permitted fisheries biologist to remove all fish from the construction area using a combination of seining and/or electrofishing techniques. Measures to avoid or reduce construction impacts on the channel and local fisheries will be incorporated into the project design as conditions of a DFG Section 1601 streambed alteration agreement. Specific requirements for reducing impacts on stream habitat will be coordinated with DFG during the agreement process.

2. Before any construction, the contractor will prepare a Spill Prevention and Countermeasure Plan (SPCP) that includes strict on-site handling rules to keep construction and maintenance materials out of drainages and the waterway. Measures to prevent contamination, clean up spills, provide staging and storing areas, and minimize equipment operations in moving water will be incorporated into the project design as conditions of a DFG Section 1601 streambed alteration agreement. Any other specific requirements for reducing impacts on stream habitat will be coordinated with NOAA Fisheries and DFG during the agreement process. This plan will provide guidelines to:

   - prevent contamination of streamside soil and the watercourse from cement, concrete, or concrete washing, asphalt, paint or other coating material, oil or other petroleum products, or hazardous materials;

   - clean up spills immediately and notify NOAA Fisheries and DFG immediately of any spill and cleanup procedures;

- provide staging and storage areas outside the stream zone for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants;

- minimize equipment operations in flowing water and remove vehicles from the normal high-water area before refueling and lubrication; and

- avoid operation of equipment in flowing water.

These measures will be incorporated into the project design as conditions of a DFG Section 1601 streambed alteration agreement. Any other specific requirements for reducing impacts on stream habitat will be coordinated with NOAA Fisheries and DFG during the agreement process.

1. Hazardous substances will be staged in areas at least 100 ft from streams and other surface waters. Refueling and vehicle maintenance will be performed at least 100 ft from these receiving waters. Sedimentation fences, certified weed-free straw bales, sandbags, water bars, and baffles will be used as additional sources of protection for waters, ditches, and wetlands.

2. Replanting to restore disturbed forest, riparian, and/or wetland areas to preconstruction condition will ensure that no permanent loss of habitat values occurs as a result of the proposed project. A revegetation plan will be prepared that includes a plant palette, design specifications, an implementation plan, maintenance requirements, and a monitoring program. Monitoring will be conducted for a minimum of 3 years during growing season (between mid-February and December) by qualified biologists to document the degree of success in achieving the success criteria and to identify additional actions that may be needed. Annual monitoring reports will be submitted to DFG, USBR, and/or USFWS. Monitoring reports will summarize the data collected, describe how the revegetation is progressing relative to the success criteria (described below), and discuss any remedial actions performed.

   The revegetation for forest, riparian, and/or wetland habitats will be considered successful when the following minimum success criteria are met:

   - The riparian forest and/or wetland established are composed of a mix of species resembling that removed during project implementation.

   - At least 75% absolute cover of native forest, riparian, and/or wetland vegetation is developed on each site.

- Growth is achieved of forest and/or riparian species that rate good or excellent for vigor and growth based on a qualitative comparison of leaf turgor, stem caliber, leaf color, and foliage density in the planted sites with individuals of the same species in adjacent undisturbed areas.

- Less than 5% absolute cover on each site will be composed of nonnative annual or perennial species.

- Plantings at each site are self-sustaining without human support (e.g., weed control, rodent control, or irrigation).

Success criteria will be finalized through coordination with plant ecologists from DFG, and/or USFWS. A brief report summarizing the results of monitoring and recommendations of additional actions will be submitted to DFG, USBR, NOAA Fisheries, and/or USFWS.

Further measures intended to protect and restore riparian habitat include:

A) Restrict removal of trees to those within the footprint of the proposed project or those blocking access to the construction site. Trees that must be removed for project completion will be clearly identified before construction.

B) Replant mixed riparian forest tree species on adjacent channel terraces that lack forested strata at a stem replacement ratio of 3:1.

C) Except for those identified for removal, the contractor will avoid damage to native trees within the boundary of the forested wetland.

D) The contractor will not conduct grading and recontouring work within the boundary of the forested wetland.

E) The contractor will replant native willow and buttonbush species at a stem replacement ratio of 3:1 on the new bank contour upon completion of construction work.

F) The contractor will minimize disturbance and removal of adjacent riparian scrub by limiting the construction corridor to 20 ft from the edge of the proposed bank and retaining wall upstream of the proposed fish ladders.

G) The contractor will remove nonnative Himalayan blackberry upstream and downstream of the proposed fish ladder at Weir No. 5 and replant the reclaimed area with native shrubs and trees such as California wild rose, buttonbush, Oregon ash, and Fremont cottonwood at a stem replacement ratio of 2:1.

H) The contractor will maintain a 10-ft buffer zone around all cottonwood trees greater than 6 inches diameter at breast height (dbh) in the vicinity of the construction zones.

The contractor will install barrier fencing to delineate the buffer zone prior to construction.

I) Tule marsh will be created in the weir vicinity (i.e., East-West Weir, Weir No. 5, Giusti Weir, and Weir No. 1) at a replacement ratio of 2:1 or tule marsh mitigation credits will be purchased from an approved wetland mitigation bank at a replacement ratio of 2:1.

J) The contractor will replant willows on the unvegetated right bank of the West Side Channel downstream of Giusti Weir at a stem replacement ratio of 2:1.

STATUS, TRENDS AND LIFE HISTORY REQUIREMENTS OF LISTED SPECIES

The following listed species are likely to be affected by the proposed project:

- Central Valley spring-run Chinook salmon - threatened
- Central Valley steelhead - threatened
- Sacramento River winter-run Chinook salmon - endangered

Sacramento Winter-run Chinook Salmon - Endangered

Status and trends

The Sacramento winter-run Chinook salmon were listed as threatened under an emergency rule on August 4, 1989 (54 FR 32085). The final rule listing the Sacramento winter-run Chinook salmon as a threatened species under the ESA was published on November 5, 1990 (55 FR 46515). The continued decline of the spawning population, expectations of weak returns in certain years as the result of two depressed year classes, and continuing threats to the population prompted NOAA Fisheries to reclassify Sacramento winter-run Chinook salmon as endangered on January 4, 1994 (59 FR 440).

Prior to construction of Shasta and Keswick dams in 1945 and 1950, respectively, winter-run Chinook were reported to spawn in the upper reaches of the Little Sacramento, McCloud, and lower Pit rivers (Moyle et al. 1989). Specific data relative to the historic run sizes of winter-run Chinook prior to 1967 are sparse and anecdotal. Numerous fishery researchers have cited Slater (1963) to indicate that the winter-run Chinook population may have been fairly small and limited to the spring-fed areas of the McCloud River before the construction of Shasta Dam. However, recent DFG research in California State Archives has cited several fisheries chronicles that indicate the winter-run Chinook population may have been much larger than previously thought. According to these qualitative and anecdotal accounts, winter-run Chinook reproduced in the McCloud, Pit and Little Sacramento rivers and may have numbered over 200,000 (Rectenwald 1989).

Completion of the Red Bluff Diversion Dam in 1966 enabled accurate estimates of all salmon runs to the upper Sacramento River based on fish counts at the fish ladders. These annual fish counts document the dramatic decline of the winter-run Chinook population. The estimated number of winter-run Chinook passing the dam from 1967 to 1969 averaged 86,509. During 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, and 2001 the spawning escapement of winter-run Chinook past the dam was estimated at 441, 191, 1180, 341, 189, 1361, 940, 841, 3002, 3288, 1352, and 5523 adults (including jacks), respectively.

Hallock and Fisher (1985) identify the following factors that have contributed to the decline of the post-Shasta Dam winter-run Chinook salmon: 1) drought, 2) the Red Bluff Diversion Dam, 3) river temperature downstream of Red Bluff, 4) juvenile salmon mortality, and 5) harvest. Two year classes of winter-run were virtually wiped out due to drought conditions in 1976-1977. These year classes have failed to show substantial recovery in subsequent generations. In addition, the strong year class of 1981 failed to return well in 1984, and at present no dominant year class exists. Low fecundity would contribute to the difficulty of recovering from any particular disaster.

All adult Chinook salmon which encounter the closed gates at RBDD are likely to be delayed from upstream migration. Delays can range from one day to 40 days at flows between 4,000 and 16,000 cfs (USFWS 1998). Delays reduce reproductive success because migrating adults do not feed but must subsist by catabolizing their body tissues. In 1986 the dam gates at RBDD were raised for a short period to allow free passage of fish through the area. Since that time, the number of months during which the gates are up (free passage) has increased to the current operating conditions which allow free passage from September 15 through May 15 in most years. This operational scenario allows approximately 85% of the adult, upstream migrating winter-run to pass the dam before the gates are closed each spring.

During most years, high summer water temperatures downstream of Red Bluff Diversion Dam make it very unlikely that winter-run salmon can spawn successfully. Factors influencing water temperatures in this area include releases from upstream dams, limnological dynamics within the reservoirs and meteorological conditions on the valley floor.

Smolt mortality is a major factor affecting winter-run Chinook salmon abundance in the Sacramento drainage. Emigrants can be entrained at unscreened or inadequately screened diversions that are operated during the migration period from July through March along the Sacramento River, and from September through June in the Delta. During periods of low net outflow to San Francisco Bay, large numbers of emigrants travel down Georgiana Slough and are lost in the maze of the Delta channels and consequently are subject to entrainment by the SWP and CVP export pumps rather than remaining in the Sacramento River. The SWP and CVP operations also kill, directly and indirectly, many smolts attempting to traverse through the Delta.

Any ocean harvest of winter-run Chinook salmon is significant because there are so few of this race remaining that any wild fish caught can affect the population.

Habitat degradation also affects winter-run Chinook salmon populations (Hallock and Fisher 1985). They noted the following factors in habitat degradation. There is a loss of spawning habitat upstream of Shasta and Keswick dams because of lack of fish passage facilities and the inundation by the reservoirs of the spawning and rearing areas. There is a lack of gravel recruitment due to sediment trapping behind dams. This lack is exacerbated by gravel mining activities. The remaining spawning gravel tends to be armored due to controlled flows from the reservoirs and the subsequent reduction of necessary flushing flows. Rip rapping the banks for bank stabilization purposes removes riparian habitat that changes water table relationships and reduces shading on the river. Rip rapping also degrades rearing habitat and increases predation on salmon juveniles.

<u>Life history and habitat requirements</u>

Chinook salmon in the Sacramento River are typically characterized as winter-, spring-, fall-run, or late-fall-run according to the time adults enter freshwater to begin their spawning migration. Accordingly, adult Sacramento winter-run Chinook salmon enter freshwater in the winter, but delay spawning until the spring and summer. Juveniles spend approximately five to nine months in the river and estuary systems before entering the ocean. This life history pattern differentiates Sacramento winter-run Chinook salmon from other Sacramento River Chinook and from all other populations within the range of Chinook salmon (Hallock and Fisher 1985).

Chinook salmon typically remain at sea for two to four years. California Chinook salmon are 'ocean-type' and migrate along the coast. Available information on California Chinook salmon populations indicates that the fish tend to stay along the California and Oregon coasts.

Adult Sacramento winter-run Chinook salmon require water temperatures between 57° and 67° F during upstream migration. When the adults reach spawning areas, they need cold pools to stage in prior to spawning to conserve energy and maintain egg viability as they mature for spawning (Berman and Quinn 1991). Maximum temperatures for holding adults are 59° to 60° F but better egg viability is achieved at 55° to 56° F (Boles et al. 1988).

Following spawning, incubation and emergence of juvenile winter-run Chinook salmon, all of which occur well upstream of the action area, most fry disperse downstream, hiding in the gravel or stationing in calm, shallow waters with fine sediments substrate and bank cover such as tree roots, logs, and submerged or overhead vegetation. As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Optimal temperature ranges for both fry and fingerlings range from 53.6° to 57.2° F with maximum growth rates at 55° F (Boles 1988). Along the emigration route, submerged and overhead cover in the form of rocks, submerged aquatic vegetation, logs, riparian vegetation, and undercut banks provide food, shade and protect juveniles from predation.

The downstream migration of fry begins almost immediately upon emergence from the gravel. This downstream movement occurs mainly at night, although small numbers of fry move during daylight hours. Once downstream migration has begun, Chinook fry can either continue to migrate down to the estuary or they may stop and rear in areas such as the Sutter Bypass for a few weeks or up to several months. The fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 50 to 75 mm in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. The emigration of juvenile Chinook may be dependent on streamflow conditions and water year type. Once fry have emerged, storm events may cause en masse emigration pulses.

In large rivers, fry tend to migrate along the margins of the river rather than in the higher velocity water near the center of the channel. When the river is deeper than about 3 meters, they tend to prefer the surface waters (Healey and Jordan 1982). The fry inhabit areas in back eddies, behind fallen trees, undercut tree roots, and other areas of bank cover. As they grow larger, the juveniles tend to move away from shore into midstream and higher velocity areas. Fish size appears to be positively correlated with water velocity and depth (Chapman and Bjornn 1969, Everest and Chapman 1972).

Day and night distributions of Chinook juveniles are different. At night, Chinook tended towards inshore areas of quiet water over sandy substrates or into pools, where they would settle at the bottom. During daylight hours, the Chinook would return to occupy the same riffle or glide areas they had occupied the previous day (Edmundson et al. 1968, Don Chapman Consultants 1989).

Principal foods of Chinook while rearing in freshwater and estuarine environments are larval and adult insects and zooplankton such as Cladocerans, Diptera, or Copepoda (Kjelson et al. 1982) of stonefly nymphs or beetle larvae (Chapman and Quistdorff 1938) as well as other estuarine and freshwater invertebrates. Chinook seem to prefer slightly larger organisms and larval and adult insects than other Pacific salmon in the intertidal region of most estuaries.

Optimal water temperatures for the growth of juvenile Chinook salmon in an estuary are 54-57° F (Brett 1952). In Suisun and San Pablo Bays water temperatures reach 54° F by February in most years. Other Delta waters do not reach 54° F until March. The specific cues that trigger juvenile Chinook salmon to migrate from the Sacramento-San Joaquin Estuary are not well understood, but water temperatures of 59° F and higher have been observed to induce migration in Northwest estuaries (Dunford 1975, Reimers 1973).

Juvenile Chinook spend three months to two years in freshwater after emergence and before undergoing smoltification. California Chinook salmon are primarily 'ocean-type' and tend to use estuaries and coastal areas more extensively than stream-type Chinook for rearing. The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions. Sacramento winter-run Chinook salmon typically migrate to the sea after 5 to 10 months of freshwater residence.

Central Valley Spring-run Chinook Salmon - Threatened

Status and trends

Effective November 16, 1999, NOAA Fisheries listed Central Valley spring-run Chinook salmon as threatened under the ESA (64 FR 50394). Historically, spring-run Chinook salmon were predominant throughout the Central Valley, occupying the upper and middle reaches of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud, and Pit Rivers, with smaller populations in most other tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1904, Clark 1929). The Central Valley drainage as a whole is estimated to have supported spring-run Chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (DFG 1998). Before the construction of Friant Dam, nearly 50,000 adults were counted in the San Joaquin River (Fry 1961). Following the completion of Friant Dam, the native population from the San Joaquin River and its tributaries was extirpated. Also, spring-run no longer exist in the American River due to Folsom Dam.

Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80% of this habitat had been lost by 1928. Yoshiyama et al. (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82% is not accessible today. Clark (1929) did not give details about his calculation. Whether Clark's or Yoshiyama's calculation is used, only remnants of the former range remain accessible today in the Central Valley (DFG 1998).

Impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley spring-run Chinook salmon. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screen water intakes, restricted and regulated streamflows, levee and bank stabilization, and poor quality and quantity of riparian and shaded riverine aquatic (SRA) cover.

Natural spawning populations of Central Valley spring-run Chinook salmon are currently restricted to accessible reaches in the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (DFG 1998; FWS, unpublished data). With the exception of Butte Creek and the Feather River, these populations are relatively small ranging from a few fish to several hundred. Butte Creek returns in 1998 and 1999 numbered approximately 20,000 and 3,600, respectively (DFG unpublished data). On the Feather River, significant numbers of spring-run Chinook, as identified by run timing, return to the Feather River Hatchery. However, coded-wire-tag information from these hatchery returns indicates substantial introgression has occurred between fall-run and spring-run Chinook populations in the Feather River due to hatchery practices.

Life history and habitat requirements

Spring-run Chinook salmon adults are estimated to leave the ocean and enter the Sacramento River from March to July (Myers et al. 1998). This run timing is well adapted for gaining access to the upper reaches of river systems (1,500 to 5,200 feet in elevation) prior to the onset of high temperatures and low flows that would inhibit access to these areas during the late summer and fall. Throughout this upstream migration phase, adults require streamflows sufficient to provide olfactory and other orientation cues used to locate their natal streams. Adequate streamflows are also necessary to allow adult passage to upstream holding habitat in natal tributary streams. The preferred temperature range for spring-run Chinook salmon completing their upstream migration is 38° F to 60° F (DFG 1998).

When they enter freshwater, spring-run Chinook salmon are immature and they must stage for several months before spawning. Their gonads mature during their summer holding period in freshwater. Over-summering adults require cold-water refuges such as deep pools to conserve energy for gamete production, redd construction, spawning, and redd guarding. The upper limit of the optimal temperature range for adults holding while eggs are maturing is 59° F to 60° F. Unusual stream temperatures during spawning migration and adult holding periods can alter or delay migration timing, accelerate or retard mutations, and increase fish susceptibility to diseases. Sustained water temperatures above 80.6° F are lethal to adults (Cramer and Hammack 1952; DFG 1998).

Adults prefer to hold in deep pools with moderate water velocities and bedrock substrate. They tend to avoid cobble, gravel, sand, and especially silt substrate in pools (Sato and Moyle 1989). Optimal water velocities for adult Chinook salmon holding pools range between 0.5-1.3 feet-per-second and depths are at least three to ten feet (G. Sato unpublished data, Marcotte 1984). The pools typically have a large bubble curtain at the head, underwater rocky ledges, and shade cover throughout the day (Ekman 1987).

Spawning typically occurs between late-August and early October with a peak in September. Once spawning is completed, adult spring-run Chinook salmon die. Spawning typically occurs in gravel beds that are located at the tails of holding pools (USFWS 1995). Spring-run adults have been observed spawning in water depths of 0.8 feet or more, and water velocities from 1.2-3.5 feet-per-second (Puckett and Hinton 1974). Eggs are deposited within the gravel where incubation, hatching, and subsequent emergence takes place. Optimum substrate for embryos is a mixture of gravel and cobble with a mean diameter of one to four inches with less than 5% fines, which are less than or equal to 0.3 inches in diameter (Reiser and Bjornn 1979). The upper preferred water temperature for spawning adult Chinook salmon is 55° F (Chambers 1956) to 57° F (Reiser and Bjornn 1979).

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable, however, hatching generally occurs within 40 to 60 days of fertilization (Vogel and Marine 1991). In Deer and Mill creeks, embryos hatch following a 3-5 month incubation period (USFWS 1995). The optimum temperature range for Chinook salmon egg incubation is 44° F to 54° F (Rich 1997). Incubating eggs show reduced egg viability and increased mortality at temperatures greater than 58° F and show 100% mortality for temperatures greater than 63° F (Velson 1987). Velson (1987) and Beacham and Murray (1990) found that developing Chinook salmon embryos exposed to water temperatures of 35° F or less before the eyed stage experienced 100% mortality (DFG 1998).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another two to four weeks until emergence. Timing of emergence within different drainages is strongly influenced by water temperature. Emergence of spring-run Chinook typically occurs from November through January in Butte and Big Chico Creeks and from January through March in Mill and Deer Creeks (DFG 1998).

Post-emergent fry seek out shallow, nearshore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 50 to 75 mm in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover to minimize the risk of predation and reduce energy expenditure. The optimum temperature range for rearing Chinook salmon fry is 50° F to 55° F (Boles et al. 1988, Rich 1997, Seymour 1956) and for fingerlings is 55° F to 60° F (Rich 1997).

In Deer and Mill creeks, juvenile spring-run Chinook, during most years, spend 9-10 months in the streams, although some may spend as long as 18 months in freshwater. Most of these "yearling" spring-run Chinook move downstream in the first high flows of the winter from November through January (USFWS 1995, DFG 1998). In Butte and Big Chico creeks, spring-run Chinook juveniles typically exit their natal tributaries soon after emergence during December and January, while some remain throughout the summer and exit the following fall as yearlings. In the Sacramento River and other tributaries, juveniles may begin migrating downstream almost immediately following emergence from the gravel with emigration occurring from December through March (Moyle, et al. 1989, Vogel and Marine 1991). Fry and parr may spend time rearing within riverine and/or estuarine habitats including natal tributaries, the Sacramento River, non-natal tributaries to the Sacramento River, and the Delta. In general, emigrating juveniles that are younger (smaller) reside longer in estuaries such as the Delta (Kjelson et al. 1982, Levy and Northcote 1982, Healey 1991). The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions. Although fry and fingerlings can enter the Delta as early as January and as late as June, their length of residency within the Delta is unknown but probably lessens as the season progresses into the late spring months (DFG 1998).

In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water. These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition. Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978). The optimal thermal range for Chinook during smoltification and seaward migration is 50° F to 55° F (Rich 1997).

Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers et al. 1998). Fisher (1994) reported that 87% of returning spring-run adults are three-years-old based on observations of adult Chinook trapped and examined at Red Bluff Diversion Dam between 1985 and 1991.

Central Valley Steelhead - Threatened

Status and trends.

Effective May 18, 1999, NOAA Fisheries listed Central Valley steelhead as threatened under the Endangered Species Act (63 FR 13347). Central Valley steelhead once ranged throughout most of the tributaries and headwaters of the Sacramento and San Joaquin basins prior to dam construction, water development, and watershed perturbations of the 19th and 20th centuries (McEwan and Jackson 1996). Historical documentation exists that show steelhead were once widespread throughout the San Joaquin River system (CALFED 1999). In the early 1960s, the California Fish and Wildlife Plan estimated a total run size of about 40,000 adults for the entire Central Valley including San Francisco Bay. The annual run size for this ESU in 1991-92 was probably less than 10,000 fish based on dam counts, hatchery returns and past spawning surveys (McEwan and Jackson 1996).

Estimates of steelhead historical habitat can be based on estimates of salmon historical habitat, although the extent of habitat loss for steelhead is probably greater than losses for salmon, because steelhead go higher into the drainages than do Chinook salmon (Yoshiyama et al. 1996). Therefore the previously stated estimates by Clark (1929) and Yoshiyama et al. (1996) of 80% and 82% (respectively) habitat loss by Chinook salmon likely equates to an even higher level of habitat loss by steelhead.

As with Central Valley spring-run Chinook, impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley steelhead. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screen water intakes, restricted and regulated streamflows, levee and bank stabilization, and poor quality and quantity of riparian and shaded riverine aquatic (SRA) habitat.

At present, wild steelhead stocks appear to be mostly confined to upper Sacramento River tributaries such as Antelope, Deer, and Mill creeks and the Yuba River (McEwan and Jackson 1996). Naturally spawning populations are also known to occur in Butte Creek, and the upper Sacramento, Feather, American, Mokelumne, and Stanislaus rivers (CALFED 1999). However, the presence of naturally spawning populations appears to correlate well with the presence of fisheries monitoring programs, and recent implementation of new monitoring efforts has found steelhead in streams previously thought not to contain a population, such as Auburn Ravine, Dry Creek, and the Stanislaus River. It is possible that other naturally spawning populations exist in Central Valley streams, but are undetected due to lack of monitoring or research programs (IEP Steelhead Project Work Team 1999).

Life history and habitat requirements.

All Central Valley steelhead are currently considered winter-run steelhead (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940's (IEP Steelhead Project Work Team 1999). Adult steelhead migrate upstream in the Sacramento River mainstem from July through March, with peaks in September and February (Bailey 1954, Hallock et al. 1961). The timing of upstream migration is generally correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. The preferred temperatures for upstream migration are between 46° F and 52° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986). Unusual stream temperatures during upstream migration periods can alter or delay migration timing, accelerate or retard mutations, and increase fish susceptibility to diseases. The minimum water depth necessary for successful upstream passage is 18 cm (Thompson 1972). Velocities of 3-4 meters per second approach the upper swimming ability of steelhead and may retard upstream migration (Reiser and Bjornn 1979).

Spawning may begin as early as late December and can extend into April with peaks from January through March (Hallock et al. 1961). Unlike Chinook salmon, not all steelhead die after spawning. Some may return to the ocean and repeat the spawning cycle for two or three years; however, the percentage of repeat spawners is generally low (Busby et al. 1996). Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may be used for spawning (Barnhart 1986, Everest 1973). Gravels of 1.3 cm to 11.7 cm in diameter (Reiser and Bjornn 1979) and flows of approximately 40-90 cm/second (Smith 1973) are generally preferred by steelhead. Reiser and Bjornn (1979) reported that steelhead prefer a water depth of 24 cm or more for spawning. The survival of embryos is reduced when fines of less than 6.4 mm comprise 20 - 25% of the substrate. Studies have shown a survival of embryos improves when intragravel velocities exceed 20 cm/hour (Phillips and Campbell 1961, Coble 1961). The preferred temperatures for spawning are between 39° F and 52° F (McEwan and Jackson 1996).

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable; hatching varies from about 19 days at an average temperature of 60° F to about 80 days at an average of 42° F. The optimum temperature range for steelhead egg incubation is 46° F to 52° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986, Leidy and Li 1987). Egg mortality may begin at temperatures above 56° F (McEwan and Jackson 1996).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another four to six weeks, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time (Shapovalov and Taft 1954). Upon emergence, steelhead fry typically inhabit shallow water along perennial stream banks. Older fry establish territories which they defend. Streamside vegetation is essential for foraging, cover, and general habitat diversity. Steelhead juveniles are usually associated with the bottom of the stream. In winter, they become inactive and hide in available cover, including gravel or woody debris.

The majority of steelhead in their first year of life occupy riffles, although some larger fish inhabit pools or deeper runs. Juvenile steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Water temperatures influence the growth rate, population density, swimming ability, ability to capture and metabolize food, and ability to withstand disease of these rearing juveniles. Rearing steelhead juveniles prefer water temperatures of 45° F to 60° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986). Temperatures above 60° F have been determined to induce varying degrees of chronic stress and associated physiological responses in juvenile steelhead (Leidy and Li 1987).

After spending one to three years in freshwater, juvenile steelhead migrate downstream to the ocean. Most Central Valley steelhead migrate to the ocean after spending two years in freshwater (Hallock et al. 1961, Hallock 1989). Barnhart (1986) reported that steelhead smolts in California range in size from 14 to 21 cm (fork length). In preparation for their entry into a saline environment, juvenile steelhead undergo physiological transformations known as smoltification that adapt them for their transition to salt water. These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition. Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978). The optimal thermal range during smoltification and seaward migration for steelhead is 44° F to 52° F (Leidy and Li 1987, Rich 1997) and temperatures above 55.4° F have been observed to inhibit formation and decrease activity of gill (Na and K) ATPase activity in steelhead, with concomitant reductions in migratory behavior and seawater survival (Zaugg and Wagner 1973, Adams et. al 1973). Hallock et al. (1961) found that juvenile steelhead in the Sacramento Basin migrated downstream during most months of the year, but the peak period of emigration occurred in the spring, with a much smaller peak in the fall.

Steelhead spend between one and four years in the ocean (usually one to two years in the Central Valley) before returning to their natal streams to spawn (Barnhart 1986, Busby et al. 1996).

ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area. The action area for this project includes the active stream channels and riparian corridors of the Sutter Bypass starting at and including the East-West Weir on the north end of the Sutter Bypass and continuing down the West Side Channel to the Tisdale Bypass approximately one third of a mile below Weir No.1, the lower most structure to be modified under this project.

Status of the Listed Species within the Action Area

With the exception of winter-run Chinook salmon, the majority of listed fish that depend on the West Side Channel of the Sutter Bypass as a migratory corridor and rearing habitat (spring-run Chinook salmon and steelhead), spawn in Butte Creek and its tributaries, upstream from the action area. Therefore, this section will concentrate on the status of the Butte Creek populations of spring-run Chinook salmon and steelhead.

Winter-run Chinook salmon are not known to spawn in Butte Creek, but use the action area as a migratory corridor and rearing habitat during and immediately following periods when high flows from the Sacramento River flood into the bypass carrying juveniles downstream and attracting adults upstream. Therefore, the status of winter-run Chinook salmon populations are not closely tied to conditions within the action area, but can be taken from the general population status provided in the previous section.

Central Valley spring-run Chinook salmon

Spring-run salmon migrate into Butte Creek from as early as mid February through June, they over-summer in pools generally from the confluence of Little Butte Creek to the barrier falls at the Quartz Bowl. Spawning occurs from September through mid-October, with the peak spawning period running from late September through early October (Hill and Webber, 1999). Unlike spring-run populations in Deer and Mill Creeks which have access to higher elevations, spring-run in Butte Creek spawn at a relatively low elevation (less than 1,130 ft). The majority of fish spawn upstream from the Parrott-Phelan Diversion located a few miles southeast of Chico. Peak spawning density occurs from the upper limit of migration below Centerville Head Dam and the Quartz Bowl pool downstream to the Covered Bridge (elevation 400 ft.), a distance of about 10 miles. In Butte Creek, there is some spatial and time overlap in spawning of fall and spring-run salmon in some years (Cramer and Demko, 1997; Hill and Webber, 1999).

During 1954, a counting station was maintained at the Parrott-Phelan Dam to record adult spring-run salmon passing through the fish ladder. Since that time, various other census techniques have been employed to evaluate spring-run populations. In recent decades, adult spring-run return numbers have been fewer than 200 adults in many years although Butte Creek recently had the highest return of spawners ever observed, with an estimated population of 20,259 fish in 1998 (CDFG, 1998). In the three years since this extremely large run, populations have remained relatively high with an estimated 3,679 adults returning in 1999, 4118 returning in 2000 and 9,605 returning in 2001. Prior to 1998, the population fluctuated significantly, from a maximum of 8,700 adults in 1960, to a low of ten fish in 1979. Some minor part of the fluctuation may be attributed to the various survey techniques that varied in rigor and comparability. Not withstanding the recent impressive returns to Butte Creek, the general trend in Central Valley spring-run salmon populations has been a decline since the 1940s. Between 1983 and 1985, CDFG attempted to reinvigorate spring-run numbers by planting surplus fry from the Feather River Hatchery. In 1988, 1,300 adult spring-run salmon returned to Butte Creek to spawn, potentially the result of the hatchery release. In the past, questionable propagation practices used in the spring-run program at the Feather River Hatchery are thought to have resulted in mixing of fall-run and spring-run Chinook salmon. As a result, questions regarding the genetic integrity of Butte Creek spring-run salmon have surfaced. Some of the potential ramifications of mixed genetics within the run could include improper migration timing, reduced tolerance to elevated water temperatures and a general reduction in viability. However, the current runs of spring-run in Butte Creek, which have not been intentionally supplemented with hatchery fish in over 15 years, do not display any of these adverse traits, and have in fact shown excellent survival and return rates.

Despite the fact that Butte Creek has several different sources of introduced water, including West Branch Feather River water, mainstem Feather River water, and Sacramento River water, there has been very little evidence of significant straying of non natal spring-run into Butte Creek. A tag recovery effort conducted during the 2001 spawning season found only fish that had been spawned in Butte Creek and no hatchery tagged fish were recovered in the upper creek during the spring-run spawning period (pers com Paul Ward March 20, 2002).

Central Valley steelhead

Steelhead use the action area as rearing habitat and as a migration corridor to and from spawning grounds in Butte Creek and other tributaries. They are present within the Butte Creek system year-round, either as juveniles rearing or migrating downstream or as adults migrating upstream or downstream. Although there are only limited observations, steelhead are thought to ascend Butte Creek in the late-fall and winter where they proceed to spawn in both the mainstem and tributaries such as Dry Creek (Brown, 1992b). Spawning takes place through the winter and into the spring (generally December through April). There are no estimates of steelhead numbers for Butte Creek. Steelhead have been reported in Butte Creek, however, principally through reports by CDFG wardens of angler catches. Steelhead juveniles were caught in Dry Creek (Brown, 1992b), but no steelhead were caught in studies of salmonid losses in agricultural diversions (Brown, 1992a). Several steelhead adults have been captured during CDFG trapping efforts for juvenile spring-run salmon, and the Sutter Bypass has been found to be used by juveniles as rearing habitat (Hill and Webber, 1999)

Factors Affecting Species Environment within the Action Area

The action area is located in Sutter County in the Central Valley of California between the Sierra Nevada and Coast Ranges. Project area elevations vary from approximately 40 ft above msl at the East-West Weir to about 30 ft above msl at Weir No. 1. The area has a Mediterranean climate that is characterized by hot, dry summers and cool, wet winters. Precipitation occurs primarily between November and April when 88% of the average annual rainfall is received. Annual rainfall averages vary in the County from 17 to 21 inches.

Butte Creek originates in the Jonesville Basin in Lassen National Forest at an elevation of 7,087 ft. Before descending to the valley floor southeast of Chico, the creek flows through the Butte Meadows Basin and then through a steep, 25-mile-long canyon. Once in the valley, Butte Creek flows through agricultural lands and state wildlife areas and is sometimes contained by levees between Chico and the creek's confluence with Butte Slough (Butte Slough outfall). The creek is divided into two channels (East Side and West Side Channels) as it enters the 40-mile-long Sutter Bypass downstream of the Butte Slough outfall. During most periods, Butte Creek enters the Sacramento River via Sacramento Slough just upstream of the mouth of the Feather River near Verona. Butte Creek's flow is augmented naturally throughout its course (through confluence with other drainages) and artificially in the upper watershed (with water diverted from the Feather River) (U.S. Fish and Wildlife Service 2000).

The Butte Slough Outfall Gates at the junction of Butte Creek and Butte Slough are operated to allow all or part of the Butte Creek flow to enter the Sacramento River. Flow into the Sacramento River ranges from zero to more than 700 cfs. Some Butte Creek flow usually continues south in Butte Slough, regardless of the outfall gate operations, because the capacity of the outfall gates and control of flow moving south in Butte Slough is limited. During the irrigation season, between March and October, most of the water entering the Butte Slough continues south to the Sutter Bypass. Although Sacramento River water could enter Butte Slough through the outfall gates when Sacramento River flow is high and Butte Slough is relatively low, flap gates and manual gate operations usually prevent water from moving from the Sacramento River and into Butte Slough.

Butte Slough flow is distributed between the west and east sides of the Sutter Bypass. The East-West Weir in conjunction with Weir 5 controls the flow split of Butte Slough water into the West Side and East Side Channels of the Sutter Bypass. Butte Slough, upstream of the East-West Weir, is capable of handling a flow of approximately 2,000 cfs within its natural banks. Under normal nonflood conditions, approximately 40% of the flow is diverted into the West Side Channel and 60% into the East Side Channel.
Butte Slough flow levels are currently recorded for Butte Slough at a gage near Meridian. The highest median flows are generally found between January and March, and the lowest median flows between June and October. During low-flows, upstream and downstream migration of Chinook salmon and steelhead has been hindered by shallow flow and at weirs and fish ladders along the West Side and East Side Channels. Such impaired passage has resulted in increased predation and other sources of direct mortality as well as reduced reproductive success due to delayed spawning and exposure to elevated water temperatures.

Flood Conditions

Butte Creek enters the Butte Basin just north of the Sutter Buttes. Although high flows in Butte Creek contribute to inundation of the Sutter Bypass, flooding is primarily from Sacramento River spill through the Tisdale, Colusa, and Moulton Weirs. Sacramento River flows in excess of 22,000 cfs spill through the Tisdale Bypass and flows in excess of 26,000 cfs spill through the Colusa Bypass. When Sacramento River discharge approaches or exceeds 55,000 cfs, a higher proportion of the flow enters the Sutter Bypass than remains in the mainstem river.

The Sutter Bypass is often flooded for as long as several months between November and April. Annual flooding of the bypass is very likely; there is an 85% chance of flooding in any year (Meridian Consulting Engineers, Inc. 1993). The mean annual duration of flooding in the Sutter Bypass is 54.3 days (Meridian Consulting Engineers, Inc. 1993). Most flooding occurs between December and February.

Studies in the Sutter and Yolo Bypasses indicate that juvenile Chinook salmon rear in flooded habitats. Field surveys performed by Jones & Stokes Associates during the 1993 and 1997 floods provided information on the use of temporarily flooded habitat by juvenile Chinook salmon in the Sutter Bypass. Juveniles were found in all habitat types sampled (flooded rice fields, other agricultural fields, and drainage ditches) (Jones & Stokes Associates 1993). Studies on the Yolo Bypass (Sommer *et al.* 1997) indicate that juvenile Chinook salmon rearing in floodplain habitat had better growth rates, feeding success, and perhaps survival than those in the river channel.

Near the bottom of the Sutter Bypass, adult anadromous fish may enter Sacramento Slough and move into the West Side Channel. Adult fish can remain in the West Side Channel or may cross to the East Side Channel at Nelson and Willow Sloughs. A series of weirs and diversions on the West Side and East Side Channels may stop or hinder migrations by creating migration barriers. When these barriers completly block returning fish they are unable to spawn in the poor habitat of the lower river and therefore provide no contribution to the continued survival of the Butte Creek spring-run population. If the barriers are only partial and cause delays in migration, then a reduction in reproductive success due to delayed spawning and exposure to elevated water temperatures can occur.

<u>Weirs</u>
Weirs within the Sutter Bypass can create migration barriers, affecting the upstream movement of adults and downstream movement of juvenile and adult Chinook salmon and steelhead.

At Weir 5 and Weir 3, passage of anadromous fish species is hindered by the lack of fish ladders and shallow water depth during low-flows. Flashboards for Weir 5 and Weir 3 are installed in April and remain in place through September to regulate flow in the West Side Channel. Flashboards are removed in the fall to allow drainage to pass and flood water to be conveyed. Weir 5 regulates flow to the West Side Channel and affects operation of the East-West Weir and flow to the East Side Channel. Low-flows created downstream of Weir 5 may hinder the movement of Chinook salmon and steelhead upstream and downstream. As previously stated, such impaired passage has resulted in increased predation and other sources of direct mortality as well as reduced reproductive success due to delayed spawning and exposure to elevated water temperatures.

Giusti Weir has a natural fish passage channel, however, low flows can still make passage difficult. As is done at the East-West Weir, Weir 5, and Weir 3, flashboards are installed in

April and remain in place through September to regulate stage in the West Side Channel. Flashboards are removed in the fall to allow drainage to pass and flood water to be conveyed.

Under low-flow conditions, which occur in the summer and fall of wet and normal years and year-round in dry years, there may not be enough flow for salmon to reach the weirs even if the flashboards are removed and the bays are open. In the spring, adult spring-run Chinook salmon may be migrating through the Sutter Bypass when the weir is operating. During low-flow conditions, weir operations could potentially block or hinder upstream fish migrations. Similarly, operation of the weirs during the fall may impede passage of adult fall-run Chinook salmon and steelhead which can result in reduced reproductive success due to delayed spawning and exposure to elevated water temperatures.

<u>Diversions</u>
Flow is diverted onto agricultural lands through gravity canals and ditches, siphons, and pumps. There are agricultural diversions associated with 3 of the 5 weirs located on the West Side Channel:

- the Butte Slough Irrigation Company's diversion at Weir 5,
- the Lanza diversion upstream of Weir 3, and
- the Amaral Ranch and Doherty Farms diversion at Giusti Weir.

Diversions in the Sutter Bypass are unscreened and are a risk for entrainment of fish. Migrating adult salmon and steelhead are not generally at risk of entrainment. However, juvenile Chinook salmon and juvenile steelhead may be present during the irrigation season (March 1–August 1) and waterfowl habitat management season (September 1–January 15) and may be entrained with the diverted water. Fish that are entrained into these diversions do not survive and therefore are unable contribute to the continuation of the race.

<u>Channel Types, Substrate, and Cover</u>
During non-flood conditions the West Side Channel is slough-like with few to no riffles, runs, or pools. The channel supports habitat for warmwater fish species. Substrate includes clay and sand. There is minimal gravel, generally near the weirs.

The waterway is bordered by dense to sparse riparian vegetation including herbaceous wetland vegetation, individual shrubs, and small trees. Several mature and immature mixed riparian forest trees are found at the East-West Weir. Riparian scrub, consisting of California wild rose and Oregon ash saplings and Great Valley cottonwood riparian forest, is found at Weir 5. Riparian scrub (sandbar willow) and several immature Oregon ash trees are found at Weir 3, covering approximately 0.005 acre (325 square ft). At Giusti Weir, riparian willow scrub has developed, and tule marsh has developed between 2 culverts in the earthen berm. At Weir 1, there is approximately 0.01 acre (650 square ft) of Great Valley mixed riparian forest.

The interior of the Sutter Bypass is a seasonally inundated floodplain, supporting habitats for migrating adult and juvenile Chinook salmon, rearing juvenile Chinook salmon and migrating juvenile steelhead. All four races of juvenile Chinook salmon use flooded vegetation for rearing cover and protection against predators. Riparian vegetation along the Sutter Bypass provides overhead cover and instream woody material that, in turn, provides instream cover.

Water Quality

Water quality depends primarily on hydrologic characteristics, mineral composition of soils, and sources of contaminants in the watershed. Streams that originate on the west slopes of the Sierra Nevada and flow to the Central Valley floor (i.e., Butte Creek, hence Butte Slough) tend to show a decrease in water quality because of urban and industrial development, diversions, agricultural runoff, and other factors. The Sutter Bypass is regularly inundated by seasonal winter storms. Summers are largely without rainfall, and agricultural lands depend on diversions from Butte Slough and the Sutter Bypass for irrigation water. In the summer and fall, much of the flow in the Sutter Bypass comes from agricultural runoff. Stormwater discharges may contain all of the following at levels that are harmful to fish:

- petroleum fuels and oils;
- organic matter such as pet and domestic livestock wastes;
- pesticides;
- heavy metals (e.g., copper, lead, cadmium, and zinc); and
- fertilizers (e.g., nitrogen and phosphorus).

Table 1 identifies the range of water temperatures found in the Sutter Bypass at Weir 1 for 1995–2000. In general, water temperatures in the Sutter Bypass from November–March are within the range of water temperatures that support Chinook salmon and steelhead. However, water temperatures in the Sutter Bypass between May and July (May, 53.6°F–80.6°F; June, 64.4°F–84°F; July, 75.2°F–82°F) can often exceed temperatures that support Chinook salmon and steelhead life stages. Therefore it is unlikely these fish would be found in this area during these warmer periods.

Table 1. Water Temperatures Found in the Sutter Bypass at Weir No. 1 1995 2000 [1]

Month	Range of Temperatures (ᴮF)
January	41.0 57.2
February	46.4 64.4
March	48.2 66.9
April	52.7 73.4
May	53.6 80.6
June	64.4 84.0
July	75.2 82.0
August [2]	--
September [2]	--
October [2]	--
November	46.0 60.8
December	44.1 51.8

[1] No temperatures were taken for 1997. Temperatures were taken in the morning only.
[2] No temperatures were taken during the months of August, September, or October.

Predation

The Sutter Bypass supports native and nonnative fish species, such as Sacramento sucker, Sacramento pikeminnow, various sunfish, catfish, striped bass, carp, and other warmwater fish species. Many of these fish prey on salmonids. The weirs and their backwaters may improve predator habitat and increase the loss of juvenile salmonids to predation during downstream movement. It is unlikely that the loss of juvenile salmonids caused by this increased level of predation has significantly impacted population sizes of listed species in Butte Creek due to the fact that the majority of juvenile outmigration occurs during high winter flows when predation is greatly reduced. Winter flooding of the Sutter Bypass reduces predation by greatly increasing the usable habitat area including relatively shallow depths, and dense flooded vegetation which provides cover for juvenile salmonids.

Poaching

Blocking or hindering upstream passage at weirs and fish ladders may expose adult Chinook salmon and steelhead to poaching. Poaching may be a significant problem because the weirs and fish ladders are easily accessible to the public. Enforcement of poaching laws at these weirs is difficult because fishing for species other than salmon is allowed. Willow Slough Weir may be an exception because the fish ladder is a new design with a metal screen cover, making fish inaccessible to poachers when the fish pass through the ladder. The extent of actual impacts of poaching in the Sutter Bypass on the listed species likelihood of survival and recovery is unknown due to the secretive nature of this impact and the paucity of information on actual numbers of fish lost to poaching. It is likely that of the three listed salmonids in the area that the spring-run Chinook salmon would be most heavily impacted due to the timing of their upstream migration through the action area coinciding with heavy public recreational use of the area.

A more detailed description of the current conditions of the weirs and diversions within the action area is provided below.

East-West Weir

The East-West Weir is a small concrete flashboard structure in the East Side Channel immediately upstream of SR 20, where Butte Slough branches into the East Side and West Side Channels of the Sutter Bypass. The Weir has 4 bays controlled by flashboards; it does not have a fish ladder.

The primary purpose of the Weir is to control the flow split of Butte Slough water into the East Side and West Side Channels of the Sutter Bypass. Flashboards are installed in the weir from April to September to regulate the division of flow into the 2 channels for downstream irrigation diversions and for management of waterfowl habitat in the Sutter National Wildlife Refuge. In the fall, the flashboards are removed to allow passage of natural and floodwater flows in the Sutter Bypass.

The Weir was built in the 1920s or 1930s; the exact date is unknown. BSIC operates the East-West Weir under informal coordination agreements with Sutter Bypass farmers. The structure is regulated by the State Reclamation Board because it is located in a bypass floodway.

Flow levels are currently recorded for Butte Slough at a gage near Meridian. Under maximum controlled flow conditions, approximately 40% of the flow is diverted into the West Side Channel of the Sutter Bypass and 60% into the East Side Channel. Butte Slough upstream of the East-West Weir is capable of conveying approximately 2,000 cfs within its natural banks.

Weir No. 5

Weir No. 5 is a full channel–width flashboard structure with 11 bays with concrete abutments. It is about 0.5 mile downstream of SR 20 on the West Side Channel. The weir is not gated and does not have a fish ladder. The structure controls water levels in the West Side Channel, providing irrigation water for BSIC diversions. Weir No. 5 was constructed in 1931 and is owned and operated by BSIC.

Flashboards are installed at Weir No. 5 from approximately April through September to provide water for irrigation. In the fall, the flashboards at the Weir are removed to accommodate floodflows. Weir No. 5 is operated under informal coordination agreements to satisfy the water needs of BSIC and users along the West Side Channel outside the boundaries of Reclamation District 70.

Upstream of Weir No. 5, BSIC has a 48-inch-diameter corrugated metal pipe under the adjacent levee that diverts water from the pool behind the weir to BSIC's irrigation canal. This diversion was constructed in 1940 and has a capacity of 55 cfs. Presently, this irrigation diversion is not screened; therefore, entrainment of juvenile anadromous fish can occur during diversion periods. Entrainment into this diversion has never been monitored so the level of loss and the effects of that loss on salmonid populations are unknown.

During the irrigation season, Weir No. 5 is operated so that upstream water surface elevations are maintained at between 37 and 39 ft NGVD to facilitate upstream diversions. On the downstream side of the weir, the surface water (or tailwater) elevation is 32–34.5 ft NGVD. The maximum difference between the upstream and downstream surface elevations at the weir is 7 ft.

Weir No. 3

Weir No. 3 was constructed in 1926 and is owned by the California Department of Water Resources (DWR) and operated by BSIC. Weir No. 3 is a small flashboard structure with 6 bays that extends part way across the West Side Channel. Immediately to the left and right of the weir are concrete abutments. The right downstream wing wall of the right abutment has slipped away and no longer provides structural support to this abutment. Extending from the left abutment to the left bank of the channel is a combination earthen and concrete spillway with bushes and small trees growing on it. Weir No. 3 has no fish ladder. The sill of the weir is concrete, and the bays are wood. Immediately upstream of the weir are a dirt road and bridge crossing to the left bank of the West Side Channel.

The primary function of Weir No. 3 is to maintain upstream water levels at 32–34.5 ft NGVD to allow operation of upstream irrigation pumps owned by the Roy Lanza Partnership. Weir No. 3 also maintains a hydraulic head for subirrigation of the agricultural fields inside the Sutter Bypass. If the water level exceeds 34 ft NGVD, upstream agricultural properties may flood, causing crop damage. Flashboards are added or removed to achieve the desired water level. When the flashboards are in place, the water level drops by up to 2 ft between the upstream and downstream sides of the weir. In late fall, the flashboards are removed to ease storm water conveyance.

Lanza Diversions

Associated with Weir No. 3 are 2 irrigation diversion pumps, owned and operated by the Roy Lanza Partnership, that pump water into the interior of the Sutter Bypass. One pump, with a flow rate of 3 cfs, is about 3,500 ft upstream of Weir No. 3; it is used occasionally to supply water to a private wetland area immediately north of the Sutter National Wildlife Refuge. The second pump, with a flow rate of 6 cfs, is approximately 4,800 ft upstream of Weir No. 3; it annually supplies irrigation water to a rice field immediately north of the private wetland. The 2 diversion pumps do not have fish screens; therefore, fish could become entrained in them when they are in operation. The proposed project will combine the 2 diversions into one 6-cfs diversion. Demands of the lower pump diversion will be met with deliveries from the upper pump through a pipeline to the lower delivery point.

Giusti Weir

Giusti Weir is an earthen embankment that juts out from the right bank of the West Side Channel. It extends about three-quarters of the way across the channel. Underneath the embankment are 3 corrugated metal pipes. The pipes are 48 inches, 66 inches, and 54 inches in diameter. Two of the pipes have limited operable flashboard guides on the upstream side of the weir; the third (middle) flashboard guide is in disrepair and is inoperable. A natural shallow channel bypasses the weir on the left side, allowing passage for fish. However, passage of migrating adult and juvenile salmon and steelhead may be hindered under low-flow conditions. The Amaral Ranch and Ellen Birchard own the property, while the Amaral Ranch tenants and Doherty Farms operate and maintain the weir. It is thought that the weir was constructed in the 1920s.

From approximately April through September, natural flows maintain water levels for 1 agricultural diversion, which has a flow rate of 25 cfs, located immediately upstream of the weir. Water is diverted under the levee via a 48-inch-diameter pipe and used to irrigate agricultural lands immediately west of the Sutter Bypass. The flow through the pipe is controlled with a 48-inch slide gate on the water side of the levee.

During the irrigation season, water upstream of the weir is maintained at a surface elevation of about 31.5 ft NGVD. The downstream (tailwater) surface elevation is approximately 30.0 ft NGVD. Therefore, the difference in water surface elevation on the 2 sides of the weir is about 1.5 ft.

Weir No. 1

Weir No. 1 is immediately north (upstream) of the Tisdale Bypass. It is a flashboard weir with 6 bays and a fish ladder located on the right abutment. Immediately to the left of the weir, an earthen embankment extends to the left bank of the West Side Channel. During the 1997 floods, a channel was cut through the left embankment to help alleviate upstream flooding. This channel, which extends to hardpan, exists today. The 1997 floods heavily damaged the weir. Originally constructed in 1924 by the State Reclamation Board for the Northern California Land Company, Weir No. 1 was rebuilt in 1974 by USFWS and a fish ladder was added. The weir is owned, operated, and maintained by USFWS.

Under present operating conditions, the upstream and downstream surface water elevations at this weir are about 31.0 ft NGVD and 22.0 ft NGVD, respectively. Therefore, the difference in elevation on the 2 sides of the weir is about 9.0 ft.

Weir No. 1 was used to provide water to the southern portion of the Sutter National Wildlife Refuge, but it does not presently provide irrigation or waterfowl habitat management benefits. There is a wetland area upstream of the weir because the water surface elevations maintained by Weir No. 1 continuously "flood" these lower lands. Wetland and riparian vegetation is abundant in this area. The wetland extends into the interior of the Sutter Bypass, which at this point is the southern portion of the wildlife refuge. All water for the refuge is obtained from an intake near Weir No. 2 in the East Side Channel of the Sutter Bypass. Therefore, Weir No. 1 no longer supplies water to the refuge, except for this wetland area.

Weir No. 1 allows Giusti Weir, which is located upstream, to retain its natural fish-passage channel. Without Weir No. 1, a fish ladder would need to be installed at Giusti Weir for migrating fish.

Passage of adult salmon and steelhead is hindered at Weir No. 1. Under low-flow conditions, which prevail in the summer and fall of wet and normal years and year-round in dry years, salmon may not reach the weir. In the spring, operation of the weir potentially affects spring-run Chinook salmon that are migrating upstream. Operation of the weir during fall, late-fall, and winter months may affect at varying levels the fall, late-fall, and winter runs of Chinook salmon and steelhead. Poaching is a problem at Weir No. 1; enforcement of poaching laws is difficult however, because fishing, except for salmon, is allowed. In addition, the backwater of Weir No. 1 may increase the loss of downstream migrating young salmon and steelhead by contributing to unnatural conditions that favor predator fish species. However, despite these adverse effects of the backwater conditions, the backwater does benefit fish by providing rearing habitat during low flow periods.

EFFECTS OF THE ACTION

This section describes potential effects on listed species associated with project construction and operations. The long-term effects of this project are expected to be highly beneficial to listed salmonids. However, there remains the potential for minor, short-term, adverse impacts, primarily during the construction phase of the project. The mitigation and minimization measures that have been incorporated into the project design are expected to greatly reduce the potential for any such adverse impacts to occur.

Construction

Construction impacts, including in-water disturbance, erosion, and potential for pollutants, are direct effects of the action which are expected to be largely temporary and the potential for any adverse impacts to listed salmonids will be minimal because construction will be completed outside of the primary period of listed species' occurrence and best management practices will be observed.

Placement of Coffer Dams

Cofferdams would be put in place, dividing the channel in half, so that construction can occur out of the water on half of the weir, while flow continues in the other half of the channel, thus preventing blockage of fish passage. The construction of coffer dams would involve the pounding of sheet piles into the stream bed. The percussion shock waves and noise produced from pile driving have been found to adversely impact juvenile salmon (Feist et al. 1992). However, it is unlikely that any juvenile salmonids would be in the project area during the late summer time period in which pile driving activities would take place due to elevated water temperatures which remain well above the tolerable thresholds for listed salmonids at this time of year. Once the cofferdam is in place, construction would occur on the dry side of the dam, and no adverse effects would occur on Chinook salmon or steelhead. Construction of the cofferdam would follow the environmental constraints established in the project description by requiring instream activities to take place between July 1 and October 15 and surveying the ponded water to remove all fish from the construction area. Surveying of the ponded water will be conducted by a professional fishery biologist using seining and/or electrofishing techniques, following approved NOAA Fisheries guidelines. In the unlikely event that a listed salmonid is encountered, it will be immediately released back to the main channel. This process is not expected to result in the injury or mortality of listed salmonids.

Loss of Shaded Riverine Aquatic Habitat

Shaded riverine aquatic habitat (SRA), including woody riparian plant species would be removed during construction activities. Removal of woody species can reduce overhead cover and affects the amount of woody material that provides instream habitat and cover. However, the majority of these impacts would be short-term due to an aggressive revegetation program that is expected to restore SRA habitat values in all but a few small areas which can not be revegetated and will incur a permanent loss of SRA. Nearly the entire length of both banks of the West Side Channel are densely vegetated with overhanging riparian and emergent aquatic vegetation. The limited short and long-term loss of SRA associated with this project is not expected to cause any increase in water temperatures or any other significant reduction in habitat values.

At the East-West Weir, approximately 0.083 acre (1,200 sq ft) of herbaceous wetland vegetation, individual shrubs, and small trees; 0.004 acre (175 sq ft) of riparian scrub; and a number of mature and immature mixed riparian forest trees including 3 mature Fremont cottonwood trees would be removed along access roads and channel banks. At Weir No. 5, approximately 0.07 acre (3,050 sq ft) of riparian scrub consisting of California wild rose and Oregon ash saplings; and 0.05 acre (2,180 sq ft) of Great Valley cottonwood riparian forest could be affected by the project construction. Approximately 0.01 acre of riparian scrub (sandbar willow) and several immature Oregon ash trees, covering approximately 0.005 acre, would be removed at Weir No. 3. Approximately 0.0005 acre (20 sq ft) of tule marsh has developed between 2 culverts in the earthen-berm at Giusti Weir, which would be replaced by riprap; and approximately 0.02 acre (870 sq ft) of riparian willow scrub would be permanently removed. At Weir No. 1, approximately 0.01 acre (650 sq ft) of Great Valley mixed riparian forest would be removed.

Removal of the riparian vegetation could weaken the streambank by loosening the soil, thus increasing the bank's susceptibility to erosion. Alteration of salmonid rearing habitat could occur if the channel bed and banks were disturbed, either mechanically or by high-flow events before they become stabilized. However, the erosion prevention and riparian restoration measures described in the project description are specifically designed to prevent these impacts from occurring.

Temporary Disruption of Bed and Bank Sediments
Construction activities adjacent to the East Side and West Side Channels would disturb soils and could cause sediment to be transported into and through the channels; this would result in temporary increases in turbidity and sedimentation downstream of construction sites. Periods of localized, high suspended sediment concentrations and turbidity owing to channel disturbance can result in a reduction of feeding opportunities for sight-feeding fish, and clogging and abrasion of gill filaments. Additionally, water quality and fish habitat could be impacted from accidental spills or seepage of hazardous materials during construction. The implementation of the SWPPP and a Spill Prevention and Countermeasure Plan are expected to greatly reduce the potential for these adverse effects to occur by implementing the best available preventative measures. Additionally, the summer work window which restricts in-water construction to between July 1 and October 15 insures that any such event would occur during the period when no listed salmonids are expected to be in the action area due to high water temperatures and life cycle timing.

Operations and Structural Changes

The dominant effect of the operations and structural changes proposed in this project would be to improve overall conditions for listed salmonids. State-of-the-art fish ladders with suitable flows would improve upstream fish passage, and fish screens on the diversions would reduce juvenile loss due to entrainment. However, there are certain aspects of the operations and structural changes proposed in this project that will produce minor adverse impacts to listed salmonids and may cause a low level of take of these species.

Riprap and Concrete Retaining Walls
The construction plans for each of the weirs calls for the placement of permanent instream riprap and/or construction of concrete retaining walls to provide support and stability to the structures and banks within the action area. The alteration of the natural habitat features that are currently found within some of these areas would likely reduce the suitability of the areas as rearing habitat for juvenile salmonids and may result in a reduction of use by holding and rearing salmon and steelhead. Extensive evidence supports the theory that salmon and steelhead prefer natural banks over riprapped banks. Li et al. (1984) demonstrated that sub-yearling salmonid densities in the Willamette River were lower at stabilized banks than at nearby natural control sites, and Peters et al. (1998) found that salmonid densities were lower at stabilized sites except when large woody debris was incorporated into the project. In the Sacramento River, Schaffter et al. (1983) used electrofishing to compare fish densities at natural and riprapped banks, and found that juvenile salmonids densities were about one third as high as along natural banks.

The banks of the East and West Channels of the Sutter Bypass are relatively undisturbed and generally densely vegetated, providing many linear miles of high quality SRA habitat. The amount and quality of salmonid habitat becomes many times greater during periods of winter flooding, which coincides with the period when the greatest numbers of juvenile salmonids are utilizing the area. Therefore, the small reduction in habitat value caused by the proposed placement of riprap and other revetment is not likely to reduce listed species reproduction, numbers or distribution within the action area.

Weir No. 5 Fish Passage Facility
The construction of the fish passage facility at Weir No. 5 is expected to greatly improve upstream fish passage past the weir and eliminate the entrainment of salmonids into BSIC's diversion pipe. However, the design of this facility does cause juvenile fish to be temporarily entrained into the headworks of the diversion structure prior to being shunted down the fish ladder and back out into the channel below the dam. The temporary "capture" of these fish into a man made structure constitutes a form of non lethal incidental take. The adverse effects associated with this low level of impact are not expected to cause a reduction in populations of salmonids within the action area. In fact, the operation of this facility is expected to greatly improve the survival of listed salmonids which could otherwise be lost to entrainment into the agricultural diversion. The other screening designs proposed in this project do not require the entrainment or bypassing of fish and are therefore not expected to cause any form of take of listed salmonids.

Interrelated and Interdependent Effects

Ongoing impacts associated with the operation of weirs and diversions in the East Side Channel (down to Nelson Slough) are interdependent on the proposed project because the timing and magnitude of flows released into the East Side Channel are controlled by the East-West Weir and Weir No. 5. The level and extent of impacts to listed salmonids in the East Side Channel have not been well quantified, however it is likely that similar passage and entrainment problems occur in this channel as those currently occurring in the West Side Channel (described in the Baseline section of this document). An effort is under way in which NOAA Fisheries is participating, called the Sutter Bypass East Side Channel Cooperative Restoration Approach, that is intended to quantify these impacts and provide solutions to the passage and entrainment problems that are currently occurring in the East Side Channel. It is expected that a separate Section 7 consultation will be conducted on the restoration actions that are developed through this process.

Synthesis of Effects

As stated above, the most dominant and profound effect of the proposed project would be a highly beneficial improvement in salmonid passage and survival within the West Side Channel of the Sutter Bypass. There are also expected to be some minor, and primarily short-term, adverse effects from the proposed project which have the potential to cause a low level of incidental take of listed salmonids. The adverse effects can be classified into two categories, the short-term construction related impacts and the permanent structural and operational effects.

Construction related effects include potential impacts due to pile driving, removal of riparian vegetation and large woody debris, erosion and deposition of bank material, and the possibility of toxic spills from construction equipment. Several mitigation and restoration measures previously described in the description of the proposed action have been incorporated into the project plan. These measures are expected to greatly reduce the potential for construction related activities to affect listed salmonids.

One of the permanent effects associated with the proposed project is a reduction in habitat quality due to the replacement of a relatively small amount of natural SRA habitat with rock riprap and concrete retaining walls. The other ongoing impact would be the momentary entrainment of downstream migrating fish into the headworks of the BSIC diversion before they are screened and routed back to the channel below Weir No. 5. Neither of these minor impacts are expected to cause any reduction in listed species reproduction, numbers or distribution within the action area.

Impacts on Evolutionarily Significant Unit Survival and Recovery

The adverse effects that are anticipated to result from the proposed project are not of the type nor magnitude that would be expected to appreciably reduce the likelihood of survival and recovery of the affected species within the action area. All of the short-term, construction related impacts are expected to be mitigated to the point that there is a very low likelihood that any listed fish will be impacted. The long-term impacts will only affect a small and relatively insignificant area of the species range and are not likely to cause any appreciable mortality of listed species over the long term. The short-term adverse effects of this project will be greatly outweighed by the benefits to species survival produced by the habitat restoration aspects of this project.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. There are no known plans or proposals for future non-federal actions that may affect the West Side Channel of the Sutter Bypass that are reasonably certain to occur.

CONCLUSION

After reviewing the best available scientific and commercial data, the current status of the endangered Sacramento River winter-run Chinook salmon, the threatened Central Valley spring-run Chinook salmon and the threatened Central Valley steelhead, the environmental baseline for the action area, the effects of the proposed project, and the cumulative effects, it is NOAA Fisheries' biological opinion that the Lower Butte Creek-Sutter Bypass West Side

Channel Fish Passage Improvement Project, as proposed, is not likely to jeopardize the continued existence of these species.

INCIDENTAL TAKE STATEMENT

Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and 7(o)(2), taking that is incidental to and not intended as part of the proposed action is not considered to be prohibited taking under the Act provided that such taking is in compliance with this Incidental Take Statement.

The measures described below are nondiscretionary, and must be undertaken by Reclamation so that they become binding conditions of any permits or grants issued, as appropriate, for the exemption in section 7(o)(2) to apply. Reclamation has a continuing duty to regulate the activities covered by this incidental take statement. If Reclamation (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, Reclamation must report the progress of the action and its impact on the species to NOAA Fisheries as specified in this Incidental Take Statement. (50 CFR §402.14(i)(3))

Amount or Extent of Take

The impacts associated with the construction and operation of the Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project have the potential to harm, harass or temporarily capture juvenile and adult life stages of Sacramento River winter-run Chinook salmon, Central Valley steelhead and Central Valley spring-run Chinook salmon. Such take could result from impacts due to instream pile driving, removal of riparian vegetation and large woody debris, erosion and deposition of bank material, and the accidental spill of toxic materials from construction equipment. Several mitigation and restoration measures have been incorporated into the project plan that are expected to greatly reduce the potential for these activities to cause the take of listed salmonids.

A permanent effect of the proposed project which could result in the take of listed salmonids is a reduction in habitat quality due to the replacement of a relatively small amount of natural SRA habitat with rock riprap and concrete retaining walls. These habitat impacts would only cause the take of listed salmonids if they were severe enough to result in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Another source of incidental take that NOAA Fisheries anticipates from the proposed project is the momentary entrainment of downstream migrating fish into the headworks of the BSIC diversion before they are screened and routed back to the channel below Weir No. 5.

The actual number of individuals likely to be subjected to each form of take from this project is impossible to determine due to annual variations in population size, run timing, meteorological conditions, and water management practices.

Because of the unpredictable nature of the level of take likely to result from the proposed project, NOAA Fisheries has determined that a qualitative measure of take of listed species may be determined through compliance with the reasonable and prudent measures and terms and conditions of this incidental take statement, as well as adherence to all other restoration and minimization measures described in the project description provided in the biological assessment for this project. Any action that is not in compliance with these documents and guidelines may be considered to cause an exceedence in anticipated take levels, thereby triggering the need to reinitiate consultation on the project.

Effect of the Take

In the accompanying biological opinion, NOAA Fisheries determined that the level of anticipated take is not likely to jeopardize the continued existence of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon, or Central Valley steelhead.

Reasonable and Prudent Measures

NOAA Fisheries believes the following reasonable and prudent measures are necessary and appropriate to minimize take of Sacramento River winter-run Chinook salmon, Central Valley spring-run Chinook salmon and Central Valley steelhead:

1. All instream activities shall be scheduled during periods when listed salmonids are not likely to be in the action area.

2. Appropriate measures shall be taken during construction activities to minimize the potential for stream bank erosion, sediment transport and discharge of hazardous materials into waterways.

3. Appropriate measures shall be taken to ensure that disturbed forest, riparian, and/or wetland areas are restored to preconstruction condition and to ensure that permanent loss of habitat values occurring as a result of the proposed project are minimized.

Terms and Conditions

Reclamation must ensure that contractors for this project comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1. All instream activities shall be scheduled during periods when listed salmonids are not likely to be in the action area.

   A. Instream construction activities will be conducted between July 1 and October 15. The construction may be extended further into the fall (with written NOAA Fisheries approval) if the mean daily water temperatures consistently exceed 68°F.

2. Appropriate measures shall be taken during construction activities to minimize the potential for stream bank erosion, sediment transport and discharge of hazardous materials into waterways.

   A. Reclamation shall ensure that contractors minimize work or equipment operation in flowing water during in-channel activities by constructing cofferdams and diverting all flows around construction sites.

   B. Reclamation shall ensure that contractors conduct all construction work according to site-specific construction plans that minimize the potential for sediment input to the aquatic system, including constructing silt barriers immediately downstream of the construction site, and minimizing disruption of the streambed at and adjacent to the construction site.

   C. Reclamation shall ensure that contractors identify all areas requiring clearing, grading, revegetation, and recontouring and minimizing the areas to be cleared, graded, and recontoured.

   D. Reclamation shall ensure that contractors store construction spoils out of the stream (above the ordinary high-water mark) and protect receiving waters from these sediment source areas with sedimentation fences or other effective sediment control devices

   E. Reclamation shall ensure that contractors grade spoil sites to minimize surface erosion, cover bare areas with mulch and revegetate all cleared areas with appropriate native, noninvasive species.

   F. Reclamation shall ensure that contractors prevent contamination of streamside soil and the watercourse from cement, concrete, or concrete washing, asphalt, paint or other coating material, oil or other petroleum products, or hazardous materials.

G. Reclamation shall ensure that contractors clean up spills immediately and notify NOAA Fisheries immediately of any spill and cleanup procedures

H. Reclamation shall ensure that contractors provide staging and storage areas outside the normal high water area for equipment, construction materials, fuels, lubricants, solvents, and other possible contaminants

I. Reclamation shall ensure that contractors minimize equipment operations in flowing water and remove equipment from the normal high-water area before refueling and lubrication; and

3. Appropriate measures shall be taken to ensure that disturbed forest, riparian, and/or wetland areas are restored to preconstruction condition and to ensure that permanent loss of habitat values occurring as a result of the proposed project are minimized.

A. Reclamation shall ensure that contractors restrict removal of trees to those within the footprint of the proposed project or those blocking access to the construction site. Trees that must be removed for project completion will be clearly identified before construction.

B. Reclamation shall ensure that contractors replant mixed riparian forest tree species on adjacent channel terraces that lack forested strata at a stem replacement ratio of 3:1.

C. Reclamation shall ensure that contractors will avoid grading and recontouring work within the boundary of the forested wetland.

D. Reclamation shall ensure that contractors will replant native willow and buttonbush species at a stem replacement ratio of 3:1 on the new bank contour upon completion of construction work.

E. Reclamation shall ensure that contractors will minimize disturbance and removal of adjacent riparian scrub by limiting the construction corridor to 20 ft from the edge of the proposed bank and retaining wall upstream of the proposed fish ladders.

F. Reclamation shall ensure that contractors will remove nonnative Himalayan blackberry upstream and downstream of the proposed fish ladder at Weir No. 5 and replant the reclaimed area with native shrubs and trees such as California wild rose, buttonbush, Oregon ash, and Fremont cottonwood at a stem replacement ratio of 2:1.

G. Reclamation shall ensure that contractors will maintain a 10-ft buffer zone around all cottonwood trees greater than 6 inches diameter at breast height (dbh) in the vicinity of the construction zones. The contractor will install barrier fencing to delineate the buffer zone prior to construction.

H. Reclamation shall ensure that tule marsh will be created in the weir vicinity (i.e., East-West Weir, Weir No. 5, Giusti Weir, and Weir No. 1) at a replacement ratio of 2:1 or tule marsh mitigation credits will be purchased from an approved wetland mitigation bank at a replacement ratio of 2:1.

I. Reclamation shall ensure that contractors will replant willows on the unvegetated right bank of the West Side Channel downstream of Giusti Weir at a stem replacement ratio of 2:1.

J. Reclamation shall submit a final construction report to NOAA Fisheries detailing the implementation of the above listed measures and the effectiveness of those measures once they have been fully implemented. If project construction takes more than one season, then an interim construction report shall be submitted to NOAA Fisheries within 6 months of completion of the first year's construction activities, followed by a final report within 6 months of the total completion of construction activities.

Updates and reports required by these terms and conditions shall be submitted to:

Office Supervisor
Sacramento Area Office
National Marine Fisheries Service
650 Capitol Mall, Suite 8-300
Sacramento, CA 95814
FAX: (916) 930-3629
Phone: (916) 930-3604
email: Michael.Tucker@noaa.gov

If Reclamation violates the terms and conditions set forth in this incidental take statement, then the level of incidental take anticipated in the accompanying biological opinion may have been exceeded. Such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. If such a situation arises, Reclamation must immediately notify NOAA Fisheries to provide an explanation of the increase in take and review with NOAA Fisheries the need for reinitiation of consultation and modification of the reasonable and prudent measures or project actions.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on a listed species, to help implement recovery plans, or to develop information.

The primary purpose of the proposed project is to benefit listed salmonids by improving passage through the action area and reducing loss of juvenile salmonids to entrainment into irrigation diversions. Throughout the development of the project plan, Reclamation has worked closely with NOAA Fisheries and the other resource agencies and stakeholders to ensure that the project would provide the maximum possible benefits to listed salmonids while reducing to the greatest extent possible, any adverse effects that might result from the implementation of the project. Therefore NOAA Fisheries has no conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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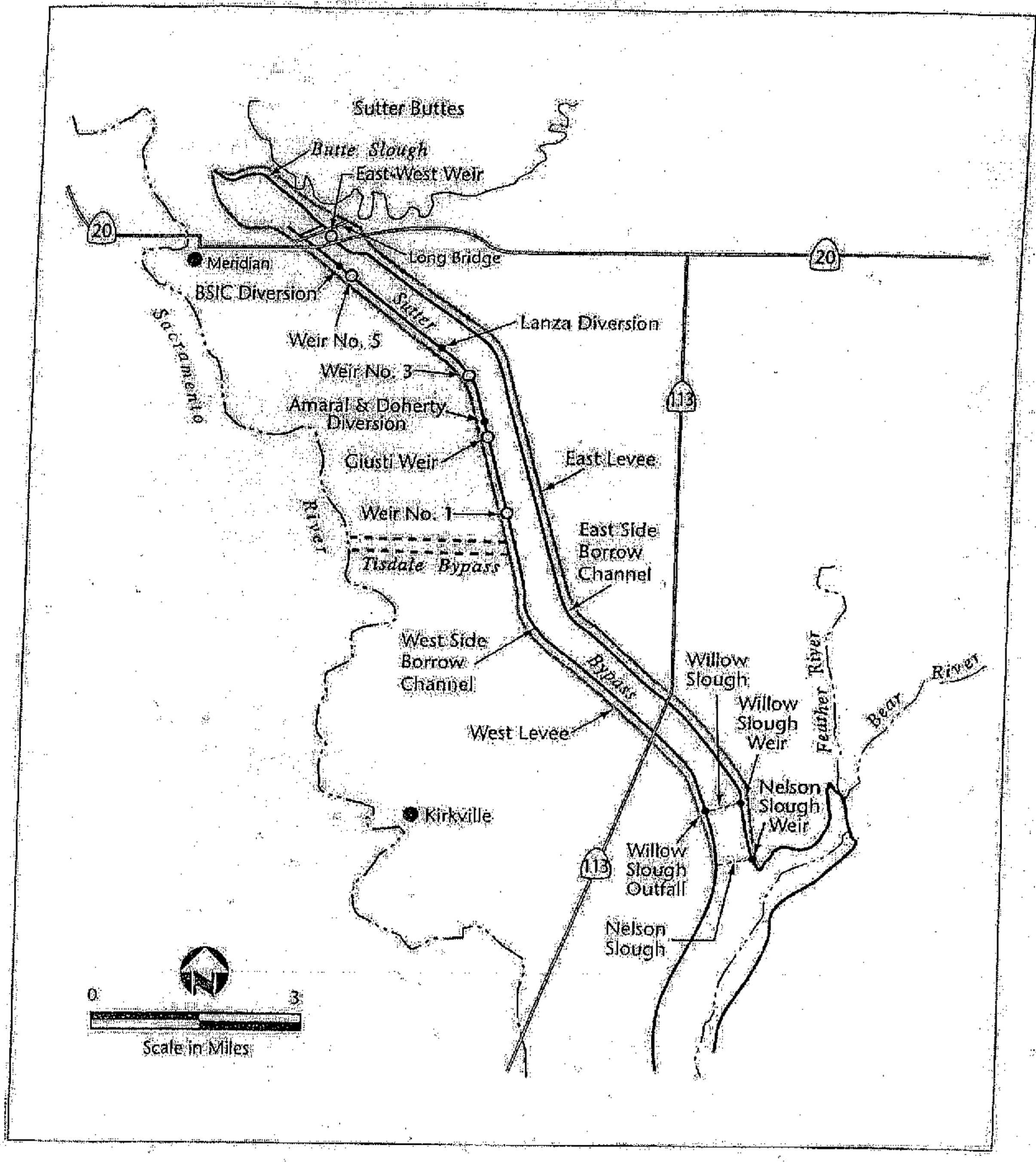

Figure 1
Project Vicinity

Enclosure 2

Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)

ESSENTIAL FISH HABITAT CONSERVATION RECOMMENDATIONS[1]
U.S. Bureau of Reclamation (Reclamation) Lower Butte Creek-Sutter Bypass West Side Channel Fish Passage Improvement Project

I. IDENTIFICATION OF ESSENTIAL FISH HABITAT

The geographic extent of freshwater essential fish habitat (EFH) for the Pacific salmon fishery includes waters currently or historically accessible to salmon within specific U.S. Geological Survey hydrologic units (Pacific Fisheries Management Council 1999). For the Sacramento River watershed, the aquatic areas identified as EFH for Chinook salmon are within the hydrologic unit map numbered 18020109 (Lower Sacramento River) and 18020112 (upper Sacramento River to Clear Creek). The upstream extent of Pacific salmon EFH in the Yuba River is to Englebright Dam at river mile (RM) 23.9.

EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

The associated biological opinion thoroughly addresses the species of Chinook salmon listed under the Endangered Species Act (ESA) as well as the MSFCMA which will potentially be affected by the proposed action, the Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*)and the Sacramento River winter-run Chinook salmon (*O. tshawytscha*). Therefore, this EFH consultation will concentrate primarily on the Central Valley fall/late fall-run Chinook salmon (*O. tshawytscha*) which is covered under the MSFCMA although not listed under the ESA.

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[1]The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) set forth new mandates for the National Marine Fisheries Service (NOAA Fisheries) and federal action agencies to protect important marine and anadromous fish habitat. Federal action agencies which fund, permit, or carry out activities that may adversely impact EFH are required to consult with NOAA Fisheries regarding potential adverse effects of their actions on EFH, and respond in writing to NOAA Fisheries "EFH Conservation Recommendations." The Pacific Fisheries Management Council has identified essential fish habitat (EFH) for the Pacific salmon fishery in Amendment 14 to the Pacific Coast Salmon Fishery Management Plan.

The Sacramento, Feather, Yuba, American, Cosumnes, Mokelumne, Stanislaus, Tuolumne, Merced, and San Joaquin Rivers, and many of their tributaries, support wild populations of the fall/late-fall Chinook salmon ESU. However, forty to fifty (40-50) percent of spawning and rearing habitats once used by these fish have been lost or degraded. Fall/late-fall run (herein "fall-run") Chinook salmon were once found throughout the Sacramento and San Joaquin River drainages, but have suffered declines since the mid-1900s as a result of several factors, including commercial fishing, blockage of spawning and rearing habitat, water flow fluctuations, unsuitable water temperatures, loss of fish in overflow basins, loss of genetic fitness and habitat competition due to straying hatchery fish, and a reduction in habitat quality.

All Chinook salmon in the Sacramento/San Joaquin Basin are genetically and physically distinguishable from coastal forms (Clark 1929). In general, San Joaquin River populations tend to mature at an earlier age and spawn later in the year than Sacramento River populations. These differences could have been phenotypic responses to the generally warmer temperature and lower flow conditions found in the San Joaquin River Basin relative to the Sacramento River Basin. There is no apparent difference in the distribution of marine coded wire tag (CWT) recoveries from Sacramento and San Joaquin River hatchery populations, nor is there genetic differences between Sacramento and San Joaquin River fall-run populations (based on DNA and allozyme analysis) of a similar magnitude to that used in distinguishing other ESUs. This apparent lack of distinguishing life-history and genetic characteristics may be due, in part, to large-scale transfers of Sacramento River fall-run Chinook salmon into the San Joaquin River Basin.

Central Valley fall-run Chinook salmon are often caught in monitoring efforts throughout the basin which are primarily focused on studying winter-run and spring-run Chinook salmon. However, despite many diverse sources of information, there has been little effort at coordinating data to attain population estimates, or to determine the viability of the wild fall-run populations remaining in the Central Valley. A general increase in salmon runs in the Sacramento River since 1990 may be attributable to several factors including, increased water supplies following the 1987-1992 drought, stricter ocean harvest regulations, and fisheries restoration actions throughout the Central Valley. This population increase has likely carried over to the wild fall-run Chinook salmon population as well. Chinook salmon production is supplemented by fall and late-fall Chinook salmon reared at the U.S. Fish and Wildlife-operated Coleman Fish Hatchery on the Sacramento River; and California Department of Fish and Game-operated Feather River Hatchery on the Feather River, Nimbus Hatchery on the American River, and Mokelumne Hatchery on the Mokelumne River (all fall-run Chinook salmon). There are indications that fall-run populations are generally stable or increasing, but it is unclear if natural populations are self-sustaining or if the appearance of stability is due to high hatchery production. Concern remains over impacts from high hatchery production and harvest levels, although ocean and freshwater harvest rates have been recently reduced.

Table 1 details the California Department of Fish and Game fall-run salmon population estimates and survey methodology. Fall-run population estimates have ranged from 0 to 1,000 fish between 1957 and 1998. In the *Comment* section of Table 1, the reader can see that fall-run surveys in Butte Creek have been extremely inconsistent in methodology, often with no surveys conducted at all. The estimates should therefore be used with caution.

Table 1 Estimates of Spawning Fall-run Chinook Salmon in Butte Creek, 1957-1998*

Year	Estimate	Comment
1957	0	One survey trip, no salmon observed.
1958	0	One survey trip, no salmon observed.
1959-1960	-	No survey.
1961	0	One aerial survey.
1962-1965	-	No estimate.
1966	0	Unknown survey technique.
1967	-	No estimate, but a few fish observed below Highway 99.
1968-1970	-	No estimate.
1971	615	November survey, Gorrill Dam to Nelson West Road.
1972	450	Nov./Dec. Survey, Oro-Durham Highway to Western Canal Dam.
1973	-	No surveys. Carcasses and live fish, but no estimate made.
1974	200	Nov./Dec. survey Durham Mutual to Western Canal Dam.
1975	1000	Oct./Nov./Dec. surveys Highway 99 to Gorrill Dam.
1976	640	Nov./Dec. surveys Highway 99 to Gorrill Dam, 500 additional fish.
1977	-	Dec. survey, 2 fish but heavy rains precluded complete survey.
1978	20	Unknown survey date.
1979	-	Unknown survey date. Fish reported in Sutter Bypass.
1980	-	Unknown survey date. Fish reported in lower Butte Creek.
1981	-	Unknown survey date. Fish numerous, no counts due to high water.
1982	-	No survey due to high flows. Observations indicated large runs.
1983	1000	November survey, Parrott-Phelan to Western Canal Dam.
1984	-	No surveys, CDFG wardens observed fish.
1985	100	Nov./Dec. survey Oro-Durham Highway to Western Canal.
1986	-	No surveys, but fish seen by various observers.
1987	-	No surveys.
1988	-	No estimate. Dec. survey found 143 carcasses b/w Durham Mutual and Gorrill Dams.
1989	-	No estimate, but Oct.-Nov. surveys found 5 live salmon between Highway 99 and the Midway.
1990-1991	-	No surveys.
1992-94	-	Incomplete records.
1995	445	Survey reach is Adams Dam to Gorrill Dam. Observations indicate that there were insignificant numbers of fish above Adams Dam. Conditions and timing were very good, but estimate was probably low.
1996	>500	Survey reach is Adams Dam to Gorrill Dam. Observations indicate that there were insignificant numbers of fish above Adams Dam. Estimate should be considered a minimum value.

1997	800	Survey reach is Adams Dam to Gorrill Dam. Observations indicate that there were insignificant numbers of fish above Adams Dam. Estimate should be considered a minimum value.
1998	>2000	Incomplete survey.

*Sources: *For the period 1957-1991: CDFG Annual Central Valley Spawning Stock Reports. For the period 1995-1997: John Nelson, CDFG, pers. comm., August 1998. For 1998: Kathy Hill, CDFG, pers. comm., 1999.*

Life History and Habitat Requirements

Central Valley fall-run Chinook are "ocean-type", entering the Sacramento and San Joaquin Rivers from July through April, and spawning from October through December. Peak spawning occurs in October and November (Reynolds et al. 1993). Chinook salmon spawning generally occurs in swift, relatively shallow riffles or along the edges of fast runs at depths greater than 6 inches, usually 1-3 feet to 10-15 feet. Preferred spawning substrate is clean loose gravel. Gravels are unsuitable for spawning when cemented with clay or fines, or when sediments settle out onto redds reducing intergravel percolation (NMFS 1997).

Egg incubation occurs from October through March, and juvenile rearing and smolt emigration occurs from January through June (Reynolds et al. 1993). Shortly after emergence from their gravel nests, most fry disperse downstream towards the Delta and estuary (Kjelson et al. 1982). The remainder of fry hide in the gravel or station in calm, shallow waters with bank cover such as tree roots, logs, and submerged or overhead vegetation. These juveniles feed and grow from January through mid-May, and emigrate to the Delta and estuary from mid-March through mid-June (Lister and Genoe 1970). As they grow, the juveniles associate with coarser substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route, tributary streams are used as rearing habitat. These non-natal rearing areas are highly productive micro-habitats providing abundant food and cover for juvenile Chinook salmon to grow to the smolt stage. Smolts are juvenile salmonids that are undergoing a physiological transformation that allows them to enter saltwater. These smolts generally spend a very short time in the Delta and estuary before entry into the ocean.

In contrast, the majority of fry carried downstream soon after emergence are believed to reside in the Delta and estuary for several months before entering the ocean (Healey 1980, 1982; Kjelson et al. 1982). Principal foods of Chinook while rearing in freshwater and estuarine environments are larval and adult insects and zooplankton such as *Daphnia,* flys, gnats, mosquitoes or copepods (Kjelson et al. 1982), stonefly nymphs or beetle larvae (Chapman and Quistdorff 1938) as well as other estuarine and freshwater invertebrates. Whether entering the Delta or estuary as a fry or juvenile, fall-run Chinook depend on passage through the Sacramento-San Joaquin Delta for access to the ocean.

The fish rear in calm, marginal areas of the river, particularly back eddies, behind fallen trees, near undercut tree roots or over areas of bank cover, and emigrate as smolts from April through June. They remain off the California coast during their ocean migration.

Adult fall-run Chinook salmon generally enter lower Butte Creek from late September through October, and sometimes as late as November. Due to low flows found during the fall months, adult fall-run may encounter impassable barriers, dewatered reaches, siltation, a lack of suitable gravel, and inadequate cover and shade until winter rains bring higher flows. Spawning generally occurs from late October through December. The majority of spawning occurs in mid-November. Fall-run salmon spawn predominately in the area below Durham Mutual Dam to the Western Canal Siphon, although in some years fall-run spawning may overlap the spring-run spawning area above Parrott-Phelan Dam. Fall-run fry migration begins in December and continues through March, with smolt out- migration from April through June. As is the case for the spring-run Chinook salmon, fall-run salmon will benefit from the recent M&T Agreement providing an additional 40 cfs of flow in Butte Creek from October 1 through June 30.

II. PROPOSED ACTION

The proposed action is described in the *Description of the Proposed Action* section of the associated Biological Opinion (Enclosure 1) for the threatened Central Valley steelhead, Central Valley spring-run Chinook salmon, and endangered Sacramento River winter-run Chinook salmon ESUs.

III. EFFECTS OF THE PROJECT ACTION

Construction

Construction impacts, including in-water disturbance, erosion, and potential for pollutants, are direct effects of the action which are expected to be largely temporary and the potential for any adverse impacts to salmon will be minimal because construction will be completed outside of the primary period of occurrence within the action area, and best management practices will be observed.

Placement of Coffer Dams

Cofferdams would be put in place, dividing the channel in half, so that construction can occur out of the water on half of the weir, while flow continues in the other half of the channel, thus preventing blockage of fish passage. The construction of coffer dams would involve the pounding of sheet piles into the stream bed. The percussion shock waves and noise produced from pile driving have been found to adversely impact juvenile salmon (Feist et al. 1992). However, it is unlikely that any juvenile salmon would be in the project area during the late summer time period in which pile driving activities would take place due to elevated water temperatures which remain well above the tolerable thresholds for salmon at this time of year. Once the cofferdam is in place, construction would occur on the dry side of the dam, and no adverse effects would occur on Chinook salmon. Construction of the cofferdam would follow the environmental constraints established in the project description by requiring instream activities to take place between July 1 and October 15 and surveying the ponded water to remove all fish from the construction area. Surveying of the ponded water will be conducted by a professional fishery biologist using seining and/or electrofishing techniques, following approved NOAA Fisheries guidelines. In the unlikely event that a salmon is encountered, it will be immediately released back to the main channel. This process is not expected to result in the injury or mortality of salmon.

Loss of Shaded Riverine Aquatic Habitat

Shaded riverine aquatic habitat (SRA), including woody riparian plant species would be removed during construction activities. Removal of woody species can reduce overhead cover and affects the amount of woody material that provides instream habitat and cover. However, the majority of these impacts would be short-term due to an aggressive revegetation program that is expected to restore SRA habitat values in all but a few small areas which can not be revegetated and will incur a permanent loss of SRA. Nearly the entire length of both banks of the West Side Channel are densely vegetated with overhanging riparian and emergent aquatic vegetation. The limited short and long-term loss of SRA associated with this project is not expected to cause any increase in water temperatures or any other significant reduction in habitat values.

Removal of the riparian vegetation could weaken the streambank by loosening the soil, thus increasing the bank's susceptibility to erosion. Alteration of salmonid rearing habitat could occur if the channel bed and banks were disturbed, either mechanically or by high-flow events before they become stabilized. However, the erosion prevention and riparian restoration measures described in the project description are specifically designed to prevent these impacts from occurring.

Temporary Disruption of Bed and Bank Sediments

Construction activities adjacent to the East Side and West Side Channels would disturb soils and could cause sediment to be transported into and through the channels; this would result in temporary increases in turbidity and sedimentation downstream of construction sites. Periods of localized, high suspended sediment concentrations and turbidity owing to channel disturbance can result in a reduction of feeding opportunities for sight-feeding fish, and clogging and abrasion of gill filaments. Additionally, water quality and fish habitat could be impacted from accidental spills or seepage of hazardous materials during construction. The implementation of the SWPPP and a Spill Prevention and Countermeasure Plan are expected to greatly reduce the potential for these adverse effects to occur by implementing the best available preventative measures. Additionally, the summer work window which restricts in-water construction to between July 1 and October 15 insures that any such event would occur during the period when no salmon are expected to be in the action area due to high water temperatures and life cycle timing.

Operations and Structural Changes

The dominant effect of the operations and structural changes proposed in this project would be to improve overall conditions for migrating salmon. State-of-the-art fish ladders with suitable flows would improve upstream fish passage, and fish screens on the diversions would reduce juvenile loss due to entrainment. However, there are certain aspects of the operations and structural changes proposed in this project that will produce minor adverse impacts to EFH.

Riprap and Concrete Retaining Walls

The construction plans for each of the weirs calls for the placement of permanent instream riprap and/or construction of concrete retaining walls to provide support and stability to the structures and banks within the action area. The alteration of the natural habitat features that are currently found within some of these areas would likely reduce the suitability of the areas as rearing habitat for juvenile salmon and may result in a reduction of use by holding and rearing salmon. Extensive evidence supports the theory that salmon and steelhead prefer natural banks over riprapped banks. Li et al. (1984) demonstrated that sub-yearling salmonid densities in the Willamette River were lower at stabilized banks than at nearby natural control sites, and Peters et al. (1998) found that salmonid densities were lower at stabilized sites except when large woody debris was incorporated into the project. In the Sacramento River, Schaffter et al. (1983) used electrofishing to compare fish densities at natural and riprapped banks, and found that juvenile salmonids densities were about one third as high as along natural banks.

The banks of the East and West Channels of the Sutter Bypass are relatively undisturbed and generally densely vegetated, providing many linear miles of high quality SRA habitat. The amount and quality of salmonid habitat becomes many times greater during periods of winter flooding, which coincides with the period when the greatest numbers of juvenile salmon are utilizing the area. Therefore, the small reduction in habitat value caused by the proposed placement of riprap and other revetment is not likely to reduce salmon reproduction, numbers or distribution within the action area.

IV. CONCLUSION

Upon review of the effects of Reclamation's lower Butte Creek-Sutter Bypass West Side Channel fish passage improvement project, NOAA Fisheries believes that the construction and operation of the fish passage improvement project features may adversely affect EFH of Pacific Chinook salmon protected under MSFCMA.

V. EFH CONSERVATION RECOMMENDATIONS

As the habitat requirements of Central Valley fall/late fall-run Chinook salmon within the action area are similar to those of the federally listed species addressed in the attached biological opinion, NOAA Fisheries recommends that Reasonable and Prudent Measures numbers 1, 2, and 3 and their respective Terms and Conditions listed in the Incidental Take Statement prepared for the Sacramento River Winter-run Chinook salmon, the Central Valley spring-run Chinook salmon and the Central Valley steelhead ESUs in the associated Biological Opinion, be adopted as EFH Conservation Recommendations.

The primary purpose of the proposed project is to benefit salmon by improving passage through the action area and reducing loss of juvenile salmonids to entrainment into irrigation diversions. Throughout the development of the project plan, Reclamation has worked closely with NOAA Fisheries and the other resource agencies and stakeholders to ensure that the project would provide the maximum possible benefits to salmon while reducing to the greatest extent possible, any adverse effects that might result from the implementation of the project. Therefore NOAA Fisheries has no further conservation recommendations.

VI. ACTION AGENCY STATUTORY REQUIREMENTS

Section 305(b)(4)(B) of the Magnuson-Stevens Act and Federal regulations (50 CFR § 600.920) to implement the EFH provisions of the Magnuson-Stevens Act require federal action agencies to provide a detailed written response to NOAA Fisheries, within 30 days of its receipt, responding to the EFH Conservation Recommendations. The response must include a description of measures adopted by the Agency for avoiding, mitigating, or offsetting the impact of the project on Pacific salmon EFH. In the case of a response that is inconsistent with NOAA Fisheries' recommendations, the Agency must explain their reasons for not following the recommendations, including the scientific justification for any disagreements with NOAA Fisheries over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(j)).

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